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Canada's Commission

Appointed to Delimit the  
Boundary Between <sup>the Provinces of</sup> Alberta  
and British Columbia

Report



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Canada: Boundary between the Provinces of  
Alberta and British Columbia, Commissioner  
appointed to Delimit the

### Commissioners

R. W. Cautley, D.L.S., A.L.S.

For the Province of Alberta and after September 20, 1915, for the Dominion of Canada as well

J. N. Wallace, D.L.S.

For the Dominion of Canada up to September 20, 1915

A. O. Wheeler, B.C.L.S.

For the Province of British Columbia

## Report of the Commission Appointed to Delimit the Boundary between the Provinces of Alberta and British Columbia

### Part I From 1913 to 1916

Office of the Surveyor General  
Ottawa, 1917

312253/35  
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BANFF, June 23, 1917.

TO THE HON. W. J. ROCHE, M.P., MINISTER OF THE INTERIOR, OTTAWA, THE HON. C. STEWART, M.P.P., MINISTER OF PUBLIC WORKS, EDMONTON, THE HON. T. D. PATTULLO, M.P.P., MINISTER OF LANDS, VICTORIA.

Your Commissioners, J. N. Wallace, D.L.S. representing the Dominion Government until the 20th September, 1915, R. W. Cautley, D. and A.L.S. representing the Government of the Province of Alberta and, after the 20th September, 1915, both the Dominion and Alberta Governments, and A. O. Wheeler, B.C.L.S., representing the Government of the Province of British Columbia, have the honour to make the following report on the work of the Commission.

The whole report, of which this volume is Part I, is designed to consist of three parts. The first part covers the operations of the Commission from the International Boundary to the Kicking Horse Pass, the second from the Kicking Horse Pass to the Yellowhead Pass and the third from the Yellowhead Pass to where the Boundary follows the 120th Meridian of west Longitude. The first part contains two introductory chapters, of which Chapter I describes the Boundary as defined by law and the authority under which the Commission was appointed, and Chapter II contains the instructions and descriptions of the methods of survey, system of control and types of monuments used. The general operations of the Commission are described in succeeding chapters.

Accompanying the report is an atlas of map sheets containing Nos. 1 to 16A, which deal particularly with Part I of the report. A general description of the map sheets will be found following Chapter VI of this part of the report.

J. N. WALLACE  
R. W. CAUTLEY  
ARTHUR O. WHEELER } *Commissioners.*



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## CHAPTER I

### DESCRIPTION OF THE BOUNDARY AS DEFINED BY LAW AND THE AUTHORITY UNDER WHICH THE COMMISSION WAS APPOINTED.

---

The boundary between the Provinces of Alberta and British Columbia is defined by Sections 7 and 8 of the Imperial Act 29 and 30 Victoria, Chapter 67, which are as follows:—

“7. Until the Union, British Columbia shall comprise all such territories, within the Dominion of Her Majesty, as are bounded to the south by the territories of the United States of America, to the west by the Pacific Ocean and the frontier of the Russian territories in North America, to the north by the Sixtieth Parallel of North Latitude, and to the East from the Boundary of the United States Northwards by the Rocky Mountains and the One hundred and twentieth Meridian of West Longitude; and shall include Queen Charlotte’s Island and all other Islands adjacent to the said Territories, except Vancouver Island and the Islands adjacent thereto.

“8. After the Union, British Columbia shall comprise all the Territories and Islands aforesaid and Vancouver Island and the Islands adjacent thereto.”

The foregoing definition describes the boundary between the Provinces of Alberta and British Columbia as extending “from the Boundary of the United States Northwards by the Rocky Mountains and the One hundred and twentieth Meridian of West Longitude.”

In the report of the Minister of the Interior to His Royal Highness in Council, which was approved on the 18th day of February, 1913, is embodied the following interpretation of the above definition, which interpretation was drawn by the Surveyor General of Dominion Lands and concurred in by the several Governments concerned:—

“Between the International Boundary and the 120th degree of longitude, the Interprovincial Boundary is the line dividing the waters flowing into the Pacific Ocean from those flowing elsewhere. This line may cross several times the meridian of 120° longitude. Should this be the case, it is proposed that the Interprovincial Boundary follow the watershed line from the International Boundary to the most northerly crossing of the meridian and thence follow the meridian to the 60th degree of latitude. The watershed line being a

natural feature is preferable to the meridian as a boundary and there are as many chances that the proposal, if agreed to, shall be in favour of one Province as of the other."

From the above quoted sections of the Imperial Act and the interpretation thereof adopted by the several Governments concerned, it will be seen that the Interprovincial Boundary, from the International Boundary to the most northerly crossing of the 120th meridian of west longitude, exists as a natural topographical feature, namely: the crest or watershed of the Rocky Mountains. Its precise delimitation, therefore, was not a matter of urgent necessity for many years after the Act was passed, but various causes arose, and grew in importance year by year, which made such delimitation advisable and even necessary.

Chief among these may be cited the discovery of valuable coal deposits at widely separated points of the Boundary, and extending over very large areas on either side of it. As a result of these discoveries, leases of coal lands have been issued by the Crown, either in the right of the Dominion of Canada or in that of the Province of British Columbia. In some cases the descriptions of these leases were based on surveys made by Dominion or Provincial land surveyors, who, for that purpose, were obliged to assume a provisional boundary; since the Boundary, or watershed, is by no means so well defined on the ground as might be supposed,—particularly in the wider passes,—the provisional boundary thus assumed is rarely, if ever, correct, and surveys made by Dominion and Provincial land surveyors, respectively, have been found to overlap.

As working mines are opened up in the vicinity of the Boundary matters of administration arise, such as the collection of royalties on coal and the control of mining operations under the respective statutes of the Dominion or Province; and while the present development of the mining industry is not such as to make these matters of urgent importance for the moment, it has gone far enough to indicate the wisdom of definitely establishing the Boundary before such development has attained the enormous proportions that must inevitably follow.

Another cause which may be mentioned is the growing value of the immense forest reserves on both sides of the main range and the necessity of marking the Boundary on the ground so that surveyors in the employ of private persons, timber lessees, fire wardens and game guardians may recognize the limits of their rights or jurisdiction.

Still another cause may be found in the growing need for information concerning the various lines of communication across the range from one province to the other. As settlement approaches the summit on either side and as various industries are inaugurated, a knowledge of the gaps through which wagon roads and pack trails can be built is of value. Heretofore, communication has only been by well known passes at long intervals apart.

The survey has furnished information concerning a number of intervening passes that will undoubtedly be made use of in the future.

It was very desirable, also, that the Boundary should be surveyed from the geographer's point of view, so that existing maps issued by the various departments of the Governments might be corrected. These maps show the Boundary as a dotted line, which, in the absence of sufficient surveys, is necessarily incorrect at many points; how great the errors are will not be known until the whole survey has been completed, but it is safe to say that it will be found to exceed three miles at some points.

Under the above circumstances it was clearly inadvisable to delay the survey of the Boundary any longer, and in April, 1912, the matter was taken up between the Surveyor General of Dominion Lands and the Surveyor General of British Columbia, at the instance of the Minister of Lands for British Columbia, with the result that the following Dominion and Provincial Orders-in-Council were made and approved for the creation of a Commission to delimit the Boundary between the Provinces of Alberta and British Columbia and the appointment of Commissioners:—

Certified copy of a Report of the Committee of the Privy Council approved by His Royal Highness the Governor General on the 18th February, 1913.

The Committee of the Privy Council have had before them a memorandum dated 10th February, 1913, from the Minister of the Interior submitting a report dated 2nd December, 1912, from the Surveyor General of Dominion Lands recommending the delimitation of the boundary between the Provinces of British Columbia and Alberta.

The Minister states that this boundary is defined by Sections 7 and 8 of the Imperial Act 29 and 30 Victoria Chapter 67 which are as follows:—

7. Until the Union, British Columbia shall comprise all such territories within the Dominion of Her Majesty as are bounded to the south by the territories of the United States of America; to the west by the Pacific Ocean and the frontier of the Russian territories in North America; to the north by the sixtieth parallel of north latitude; and to the east from the boundary of the United States northwards by the Rocky Mountains and the one hundred and twentieth meridian of west longitude; and shall include Queen Charlotte's Island, and all other islands adjacent to the said territories, except Vancouver Island and the islands adjacent thereto.

8. After the Union, British Columbia shall comprise all the territories and islands aforesaid, and Vancouver Island and the islands adjacent thereto.

The Minister observes that the said boundary after it has been surveyed will have to be accepted by the Legislatures of British Columbia and Alberta before the parliament of Canada can by virtue of the provisions of the British North America Act 1871 pass an Act declaring that line to be the boundary between the Provinces. The two Provinces must therefore be invited to join with the Dominion in the survey of the said line.

The Committee, on the recommendation of the Minister of the Interior, advises that this invitation be conveyed to the Governments of British Columbia and Alberta and that copy of this Minute if approved be transmitted to the Lieutenant Governors of British Columbia and Alberta for the consideration of their respective Ministers.

All of which is respectfully submitted for approval.

RODOLPHE BOUDREAU,  
Clerk of Privy Council.

Certified copy of a Minute of the Executive Council of the Province of Alberta, dated Monday, 16th June, 1913, approved by His Honour the Lieutenant Governor.

The Hon. the Minister of Public Works reports, under date of May 30th, 1913, that:—

Whereas by report of the Committee of the Privy Council, approved by His Royal Highness the Governor General on the 18th day of February, 1913, dealing with the delimitation of the boundary between the Provinces of British Columbia and Alberta, a copy of which said report is hereto attached, it is set forth that the said boundary, after being surveyed, will have to be accepted by the Legislatures of British Columbia and Alberta before the Parliament of Canada, by virtue of the provisions of the British North America Act of 1871, pass an Act declaring that the line as surveyed be the boundary between the two Provinces, and that, therefore, the said Provinces should be invited to join with the Dominion in the survey of the said line;

AND WHEREAS a certified copy of the said report of the Committee of the Privy Council has been transmitted to the Lieutenant Governor of the Province of Alberta, conveying an invitation to join in the said survey, one-third of the costs of such survey to be paid by the Dominion of Canada, one-third by the Province of British Columbia, and one-third by the Province of Alberta;

AND WHEREAS it is deemed advisable that the Province of Alberta should join in the said survey, and that a representative of the Province should be appointed for that purpose;

THEREFORE, upon the recommendation of the Hon. the Minister of Public Works, the Executive Council advises that the invitation to join in the said survey be accepted by the Province of Alberta, the said Province to pay one-third of said costs;

The Executive Council further advises that Richard William Cautley, of the City of Edmonton, in the Province of Alberta, Dominion and Alberta Land Surveyor, be appointed as representative of the Province of Alberta, . . . . . and that a copy of the Order in Council made in pursuance of this recommendation, if approved, be submitted to His Royal Highness, the Governor General of Canada, for the consideration of his Ministers.

Certified a true copy.

DONALD BAKER,  
Clerk of Executive Council.

Certified copy of a report of the Committee of the Privy Council, approved by His Excellency the Administrator on the 11th of July, 1913.

The Committee of the Privy Council have had before them a report, dated 4th July, 1913, from the Minister of the Interior, stating that by Order in Council of the 18th February, 1913, the Governments of British Columbia and Alberta were invited to join the Dominion in the delimitation of the boundary between the two Provinces from the International Boundary northwesterly to the 120th degree of longitude.

The Minister observes that the invitation has been accepted by the two Provinces, as stated in a minute of the Executive Council of British Columbia dated 2nd June, 1913, and in a minute of the Executive Council of Alberta, dated the 16th of June, 1913, certified copies of which were transmitted to the Honourable the Secretary of State.

The Committee, on the recommendation of the Minister of the Interior, advise that Mr. J. N. Wallace, Dominion Land Surveyor, now in charge of levelling on Dominion Land Surveys, be appointed Boundary Commissioner to represent the Dominion upon the joint survey. . . . .

The Committee, on the same recommendation, further advise that the Surveyor General of Dominion Lands be authorized to communicate with the Surveyor General of British Columbia and the Director of Surveys of Alberta and to make such arrangements for carrying out the survey as may be necessary, and that a copy hereof be transmitted by the Honourable the Secretary of State to the Lieutenant Governors of British Columbia and Alberta for the consideration of their respective Ministers.

All of which is respectfully submitted for approval.

RODOLPHE BOUDREAU,  
Clerk of the Privy Council.

COPY OF A REPORT of a Committee of the Honourable the Executive Council, approved by His Honour the Lieutenant Governor on the first day of August, 1913.

To HIS HONOUR THE LIEUTENANT GOVERNOR IN COUNCIL:

The undersigned has the honour to report that

Whereas His Excellency, the Governor General in Council, on the 18th February, 1913, extended an invitation to the Governments of the Provinces of Alberta and British Columbia to participate in a joint survey of the boundary of the said Provinces:

And whereas His Honour, the Lieutenant Governor in Council, on the 2nd day of June, 1913, approved a recommendation that the invitation of the Federal Government be accepted, and that the Surveyor General be authorized to make such arrangements for carrying out the work as he might deem fit:

And whereas His Excellency, the Administrator in the Privy Council of Canada, on the 11th day of July, 1913, authorized the Surveyor General of Dominion Lands to make such arrangements as might be necessary for carrying out the survey, and furthermore approved the appointment of Mr. J. N. Wallace, Dominion Land Surveyor, as Boundary Commissioner, to represent the Dominion Government upon the said joint survey:

The undersigned therefore begs to recommend that Mr. Arthur O. Wheeler, British Columbia Land Surveyor, be appointed Boundary Commissioner to represent the Province of British Columbia upon the joint survey aforesaid:

And that a certified copy of this Minute, if approved, be transmitted to the Honourable the Secretary of State.

Dated this 29th day of July, A.D., 1913.

WM. R. ROSS,

Minister of Lands.

Approved this 29th day of July, A.D., 1913.

RICHARD McBRIDE,  
Presiding Member of the Executive Council.

Certified Copy of a Report of the Committee of the Privy Council, approved by His Excellency the Deputy Governor General on the 20th September, 1915.

The Committee of the Privy Council have had before them a report, dated 10th July, 1915, from the Minister of the Interior, stating that, by agreement with the Provinces of Alberta and British Columbia sanctioned by Order in Council of the 11th July, 1913, (P.C. No. 1721), the survey of the boundary between the two Provinces has been proceeding for the last two years with three Commissioners, namely: J. N. Wallace for the Dominion, R. W. Cautley for Alberta and A. O. Wheeler for British Columbia. The survey is executed by two parties, one in charge of Mr. Wheeler for the topography and the other one in charge of Mr. Cautley for locating the Boundary line.

In order that the expenses of the Dominion Commissioner, for which no money is available, may be dispensed with, the Minister recommends that R. W. Cautley be appointed Commissioner to represent the Dominion in the place of J. N. Wallace. The interests of the Dominion and of Alberta in this connection being identical, the protection of these interests may be safely left in the hands of the Alberta Commissioner.

The Committee concur in the foregoing and submit the same for approval.

RODOLPHE BOUDREAU,  
Clerk of the Privy Council.



## CHAPTER II

### INSTRUCTIONS, METHODS OF SURVEY, SYSTEM OF CONTROL AND TYPES OF MONUMENTS USED.

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#### INSTRUCTIONS

By mutual consent of the heads of the Land Survey Departments of the several Governments concerned, it was arranged that the work of the Commission be carried on under the direct supervision of the Surveyor General of Dominion Lands, and, on the 18th June, 1913, the following instructions to the Commission as a whole were issued to the several Commissioners:—

“To J. N. Wallace, D.L.S.  
A. O. Wheeler, B.C.L.S.  
and R. W. Cautley, A.L.S.

OTTAWA, 18th June, 1913

Gentlemen:—

On behalf of the Surveyor General of British Columbia, the Director of Surveys of Alberta and the Department of the Interior, I have the honour to give you the following instructions for the delimitation of the boundary between British Columbia and Alberta.

1. The Interprovincial Boundary between the International Boundary and the 120th degree of longitude, which is the part of the boundary which you have to survey, is the line dividing the waters flowing into the Pacific Ocean from those flowing elsewhere. This line may cross several times the meridian of 120° longitude. Should this prove to be the case, the boundary shall follow the watershed line from the International Boundary to the most northerly crossing of the meridian and thence follow the meridian to the 60th degree of latitude.
2. Places may be found where the water of a stream, of a glacier, or of a lake divides and flows on one side towards the Pacific Ocean and on the other side towards the Arctic Ocean or the Gulf of Mexico. The stream, from the point where it separates in two directions, shall be followed up to that one of its sources which more nearly divides the basin of the stream into two parts of equal area.
3. Should any place be found where water originally flowing to one side has been artificially diverted to the other side, the boundary shall be defined as if the stream had never been diverted and were still flowing in its original channel.

4. Where the watershed line is sharp and well defined, it shall be adopted, but where the land is flat or rolling and where there might be some doubt as to its position, it shall be defined by a series of straight lines running given distances on stated bearings in the general direction of the sinuous line of watershed and monuments shall be established at the points of deflection.
5. The portions of the boundary requiring first attention are:
  - (a) The Crowsnest Pass, owing to the proximity of mining properties.
  - (b) The Vermilion Pass, owing to the construction of the motor road from Banff to Windermere.
  - (c) The Howse Pass, owing to the proximity of timber claims.
  - (d) The Kicking Horse Pass, Simpson Pass and White Man Pass, owing to their lying within or adjacent to populated areas. The first being within the Railway Belt on the British Columbia side may possibly be left out of the category.
  - (e) The Athabaska Pass which may possibly become a railway route.
  - (f) The S. Kootenay, the N. Kootenay, N. Fork and Kananaskis Passes.
  - (g) The Moose Pass, which may become of importance as a feasible route to the North via the Smoky River.
  - (h) The Robson Pass, which is of no importance, except as one of the most striking scenic centres of the entire mountain region.Work can be commenced at the Vermilion Pass and carried southward in rotation to the International Boundary.
6. The monuments shall be concrete pyramids two feet high upon a concrete foundation of suitable depth. On opposite faces of the pyramid shall be inserted brass plates with suitable inscriptions.
7. Monuments shall be erected:
  - (a) at the lowest point of the summit of each pass.
  - (b) on one or both sides of, and as near as may be convenient to, any line of railway crossing the summit thereof.
  - (c) at such other points in the various passes as may appear suitable in such a way that no two adjacent monuments shall be more than half a mile apart and that every monument shall be visible from the next one.
8. The survey of the boundary across each pass shall be connected by a traverse with some monument of the Dominion Lands System of Survey and with some monument of the British Columbia Surveys provided such monuments are to be found within fifteen miles from the pass.
9. A photograph of each monument, looking in the direction of the boundary, shall be attached to the field notes as a further means of identification.
10. A topographical survey shall be made extending a few miles on each side of the boundary.

11. Mr. A. O. Wheeler shall be in charge of the topographical portion of the survey and the establishment of survey monuments on the peaks adjacent to the passes with a separate party consisting of one assistant surveyor, two labourers, one cook, one packer and ten horses.
12. Mr. R. W. Cautley shall be in charge of the surveying party required to take levels and make the preliminary survey of the boundary in the various passes and the erection of permanent boundary monuments therein with a separate party comprising two chainmen, one rodman, two axemen and monument builders, one cook, one packer and ten horses.
13. Mr. J. N. Wallace shall visit each pass at such times as may be necessary to enable him to satisfy himself as to the correctness of the work.

Sections 14 and 15 relate to the expenses of the surveys and to the rates of pay of the members of the parties.

16. The returns of the survey shall be made in triplicate, one copy being for the Government of British Columbia, one for the Government of Alberta and one for the Dominion Government. They shall consist of plans on a suitable scale, field notes and a joint report.
17. Any question not provided for in these instructions, whether it relates to the definition of the boundary or to any other matter, shall be decided by yourselves. If after thorough discussion the divergence of your views is such that there is no hope of your reaching a unanimous conclusion, you shall refer the question for decision to your respective Governments.

E. DEVILLE,  
Surveyor General.

#### AMENDMENTS TO INSTRUCTIONS

As the work of the Commission proceeded it was found desirable that the above Instructions should be varied in a few minor details, and, on the recommendation of your Commissioners, dated the 24th February, 1914, the following amendments were agreed to by the Surveyor General of Dominion Lands on behalf of the several Governments concerned:—

1. Section 7, subsection (a) was amended by inserting the word "suitable" between the words "lowest" and "point," so that the subsection as amended is "(a) at the lowest suitable point of the summit of each pass."
2. Section 7, subsection (c) was amended by inserting the words "whenever such is practicable" between the words "that" and "every," so that the subsection as amended is "(c) at such other points in the various passes as may appear suitable in such a way that no two adjacent monuments shall be more than half a mile apart and that, whenever such is practicable, every monument shall be visible from the next one."

## 3. By the insertion of a new section 5A as follows:—

“5A. The boundary shall also be established in any passes of small extent which may be found to be immediately adjacent to, and not separated by any high mountains from the passes already specified in these Instructions, provided that, in the unanimous opinion of the Commission, the survey of the boundary in such small adjacent passes can be undertaken without undue delay of the general progress of the Boundary Survey.”

**METHODS OF SURVEY**

The Methods of survey prescribed by the above instructions are twofold and absolutely different as to the means employed and the objects sought to be attained; they demand different qualifications both on the part of the chiefs and their assistants, different equipment and almost complete independence of action.

Since the watershed is a sinuous and, in the passes, frequently obscure line it is not possible to establish its actual position by placing monuments at various points along its length, and it is therefore necessary to establish the Boundary as a series of straight lines which approximate the true position of the watershed. Thus the survey of the Boundary in the various passes consists of a number of concrete monuments placed by the Commissioners at such points of the watershed as may seem most suitable, with the special object in view that the connecting straight lines shall as nearly as possible coincide with the actual line of watershed, or shall at least equalize the areas cut off by such straight lines on either side of the watershed. It is therefore an ordinary line survey made with great care and marked by very enduring monuments which fulfils two objects: first, it establishes an arbitrary boundary in the pass itself; secondly, it provides a carefully measured base for the system of triangles on which the work of the topographical section of the Commission depends, and for the trigonometrical connection with pre-existing surveys which provides the system of control.

The survey of the Boundary beyond the passes is carried on as a topographical delineation of the watershed by means of photo-topography depending on an extended system of triangulation. The Boundary thus established is the natural watershed and is therefore not marked with monuments, but it is capable of being mapped with a greater accuracy than could possibly be attained in any other way. Besides this primary object of the topographical work, it supplies a wealth of detailed information in regard to the mountains, valleys, forests, lakes and watershed system on either side of the actual watershed which is, for the most part, quite original and invaluable to the geographer and scientist.

## METHODS OF SURVEY IN THE PASSES

All the work in connection with the preliminary and final surveys in the passes is done by Mr. Cautley's party, but the location of the monuments is decided upon by the Commission as a whole, on the evidence adduced from the preliminary surveys.

It has been the object of the Commission to extend the straight line boundary in passes to timber line on either side of each pass, because wherever there is timber the line of natural watershed is usually more or less obscure, and, secondly, because it is difficult to define the watershed by photographic methods with a sufficient degree of precision where the surface is timbered. In this connection it may be noted that practically all the lower passes of the Rocky Mountains are heavily timbered, and that timber line is found at an elevation above sea level of from 7000 to 7800 feet.

On reaching a pass the first day's work frequently consists in exploring the pass, and climbing to some point from which the whole pass can be viewed. In other cases the watershed is sufficiently apparent to enable the party to commence cutting out trial lines at once. In still other cases the summit of the pass is a marshy flat which requires to be cross-sectioned and levelled before the initial point can be determined. In all cases, the first work to be done consists in tracing the line of watershed right across the pass, surveying it by means of traverse lines and plotting it so that the Commissioners may realize what the position of the line of watershed is in relation to the lines of the preliminary traverse on the ground. In this way the Commissioners are able to decide where the monuments should be placed, although the sites chosen are often in the midst of thick woods, and to know how the straight line boundaries between monuments will lie in regard to the adjacent line of watershed, when they are cut out.

The watershed of the Rocky Mountains is generally capable of being determined by inspection, after carefully following up the various directions of drainage, but it is frequently necessary to establish the initial points at the bottom of small depressions in the watershed by means of comparative levelling. In determining the watershed it is always necessary to work *up* from the initial point at the summit of the pass, or from the initial point of each small valley, depression or draw which governs the local drainage; any attempt to work *down* from some apparently obvious point of the watershed higher up generally leads to inconclusive results, and must be regarded as a waste of time.

The character of the watershed may be broadly classified as "determinate" or "indeterminate."

Determinate watershed includes all those cases where there can be no possible doubt as to its location, varying from the knife-like arête above timber line, which positively defines the watershed within a few inches, to the broad-

backed ridge on which the actual watershed may lie anywhere within a cross-section of fifty feet, but beyond which limits there can be no doubt.

Indeterminate watershed is more varied in character, and its lack of definition is due to very different causes, among which may be mentioned:—

1. Marsh or muskeg land in which the flow of drainage is not perceptible, where the only course to pursue is to cross-section and take levels over the area intervening between points of positive drainage in either direction and thus determine an initial point from which to work.
2. Places where the water of a stream, a lake or a glacier divides and flows on one side towards the Pacific Ocean and on the other side towards the Arctic Ocean, for dealing with which an arbitrary method of delimitation is prescribed in section 2 of the Instructions.
3. Land-locked areas which have no direct surface drainage. In dealing with these cases the general rule adopted by the Commission has been that "Any depression on the watershed which does not have direct surface channel drainage must be considered as draining toward that part of the rim which is lowest, and which would first be overflowed by water that had accumulated in such depression."
4. Broad mountain sides, which are, to all intents and purposes, inclined planes without clearly marked or continuous indications of drainage, and on which very slight variations in inclination would deflect the drainage one way or the other. This is perhaps the most common cause of difficulty, and the only practicable way to deal with it is to carefully ascertain the location of the watershed at the base of the hill and proceed thence in the line of direct ascent.
5. Broken ground in which the surface is hummocky or cut up by numerous small ridges into a succession of irregular depressions without outlet. This kind of surface drains subterraneously, so that it is impossible to determine where the watershed is from surface indications. In these cases the Commissioners have established an arbitrary line of watershed in reference to the nearest points on either side of the broken ground at which the line of watershed is clearly defined.

As soon as the preliminary work in a pass has been finished, the Commissioners go over it and decide where the monuments shall be placed. The considerations which have to be taken into account are:—

1. That all monuments shall be situated on the actual watershed.
2. That the monuments shall be so placed that the straight line connecting any two adjacent monuments may coincide as nearly as possible with the line of watershed, or, if the line of watershed is so crooked that this is not possible, that the areas cut off on either side of the straight line, between it and the line of watershed, may be compensated as nearly as possible.

3. That the monuments shall occupy naturally prominent positions, both on general grounds of advantage and so that, wherever practicable, every monument may be visible from the next one.
4. That no two adjacent monuments shall be more than half a mile apart, except in cases of practical necessity.

This work is of great importance and is always gone into very thoroughly by the Commissioners, for although there may be a dozen possible sites for a given monument that will equally well satisfy conditions 1, 2 and 4 it is more difficult to choose the best site to fulfill condition 3 as well, especially when it is remembered that condition 3 involves the position of the monuments on both sides of the one under consideration.

When all the monument sites have been decided upon, the final survey of the Boundary is commenced. First, trial lines are cut between the monument sites, and the monuments themselves are built. It is only when the monuments are actually built that it is possible to proceed with the final survey, of which, alone, records are registered with the several Governments.

#### FINAL SURVEY

The final survey consists of the following operations:—

1. The building of the monuments, of which a separate description is given on page 17 of this report.
2. Cutting out the lines between monuments. As a rule these lines occur in thickly timbered country, and they are cut out so as to give a clear opening to the sky of six feet, which means that they are from ten to fourteen feet wide on the surface according to the nature of the timber.
3. Observing to determine the astronomic azimuth of the lines of the Boundary survey, referred to the local meridian of that one of the monuments which it is found convenient to use as an observation station. A number of observations are taken with a 6-inch reiterating transit of the Block Survey type, and the error of the resulting mean azimuth should not exceed  $10''$ .
4. Observing for the declination of the Magnetic Needle.
5. Reading azimuths and vertical angles of elevation or depression at each monument. Reciprocal readings of elevation or depression are read between each pair of adjacent monuments, thus affording a valuable check and eliminating errors due to curvature, and the height of the instrument above the top of each monument is measured. The vertical readings are used to compute the altitude above sea-level of the top of each monument with reference to the initial observing station, in the vicinity of each pass, of which the altitude above sea-level is first established. The altitude of such observing stations—and of all monuments and points of the survey—is derived from trigonometric levels carried forward by the Topographical division from the nearest point of previously established

altitude, or point of control, except in those passes which include such points of control whence the required altitude can be directly derived.

6. Chaining the distances between monuments. This is done with a 330-foot steel band tape and is all hypotenuse measurement, the angles of elevation or depression being measured with a transit and the chainage points being taken on a tripod.

The precise method is as follows:—The surveyor draws out the chain from the initial monument along the line to be measured; the assistant holds the end of the chain on the point of the monument and the surveyor takes a careful preliminary point of measurement, over which he sets his transit; clamping the horizontal circle so that the telescope is in the line to be measured, the measurement is again taken to the axis of the instrument; if it is found that the instrument is not in correct position it is moved until it is found to be so; the surveyor then reads the angle of elevation or depression to the top of the monument; the assistant comes forward with his tripod, and takes the end of the chain on to the next point of measurement, where, having taken a preliminary measurement, he sets the tripod firmly and the measurement is again taken from the axis of the transit and marked in pencil on the top of the tripod; the surveyor then reads the angle of elevation or depression on the top of the tripod; the surveyor then goes forward with his transit and, taking the end of the chain from the assistant, draws out another chain length, and the process is repeated until the whole course has been measured.

All measurements are checked, either by re-measurement or by triangulation.

7. Photographing all monuments and lines. These photographs are made in accordance with the instructions for the purpose of record, and as an identification of the various monuments.
8. Connecting the Boundary survey with the nearest lines of the Dominion Lands System and with British Columbia surveys. In some cases the nearest lines occur in close proximity to the Boundary, and the connection is made by ordinary survey methods. In other cases the nearest lines may be fifteen miles away—the limit prescribed in the instructions—and separated from the Boundary by a heavily timbered and mountainous country, and the work of making connection involves an expedition to find the lines in the first place and a complete subsidiary triangulation to make the connection afterwards. In such cases the work is generally arranged between the Commissioners as a joint undertaking.

#### METHODS OF TOPOGRAPHICAL SURVEY

The topographical work of the Commission is entirely in the hands of Mr. Wheeler. It consists in the delineation of the watershed along the main range from the International Boundary northward to the final crossing of the

120th meridian of west longitude. The 120th meridian then becomes the Interprovincial Boundary.

To define the position of this line it was decided to adopt the method of photo-topography as the one best suited to the mapping of the highly accentuated contours of mountain areas. In the travelled main passes through the range, more precise methods were employed by Mr. Cautley's division of the survey, which have already been described herein.

The method of photo-topography was introduced to Canada by E. Deville, LL.D., Surveyor General of Dominion Lands, as long ago as 1885 and has been extensively used since then in the survey of mountainous districts. Dr. Deville has given the science much study and has brought it to a high state of precision.

The work requires a specially constructed camera and mountain transit-theodolite. It is carried on by climbing to previously selected stations at the summits of the peaks, or to high points on mountain ridges that command a view of the area to be mapped. From these a series of views is taken and their direction established by the use of the transit-theodolite, frequently entailing a precarious balancing over dizzy depths. Rock cairns are erected at the selected stations, either in advance or at the time they are occupied, and are used for identification purposes.

The stations are fixed in position by a triangulation of a greater or less degree of precision, expanded from a given base and extended over the required area. This triangulation may be made independently or be carried on at the same time as the photographing.

The altitudes of the various points are obtained by reading angles of elevation or depression back and forth from point to point and applying the necessary corrections for curvature and refraction, a process known technically as trigonometric levelling.

The chief advantage of the method is its rapidity for work in the field. It is much more rapid than any other that can be applied to the same class of country and the standard of accuracy is a high one. It is true that work can only be carried on in fine weather, when the stations are below the clouds and the landscape is sufficiently clear to be photographed, but the same limitation applies to any other method that can be used. Only a small party, generally a surveyor and one or two assistants, is required to carry the instruments, take the views, record the transit readings and build the rock cairns or other signals that may be erected to mark the stations it is desired to perpetuate. The instrumental outfit, adapted by Dr. Deville, weighs about 45 lbs., and is so disposed as to be easily carried, even when the climbing is dangerous.

The camera is of fixed focus and has a wide-angle lens covering about 52 degrees of arc for one view. It is adapted in two positions to a light, strong tripod with sliding legs, to which are attached levelling screws to bring the plate exposed in the camera to a vertical position, an absolute necessity to obtain suitable views. The same tripod fits the transit-theodolite.

The size of the plate used is  $6\frac{1}{2}''$  by  $4\frac{3}{4}''$  and the lens gives very nearly a true perspective. Later, in the office, the plates are developed and bromide enlargements,  $9\frac{1}{2}$  by 13 inches, are made for mapping purposes. Practically speaking they are perspectives of the views and, by means of geometric and perspective constructions, the position and altitude of points seen in them can be obtained and the contour outlines of the various topographical features drawn on the plan. It is an interesting process: landscapes seen from the dominating height of a peak show a chaos of mountains, snowfields, icefalls, forested valleys, streams and lakes—here, there, everywhere. Often from an exceptional height the irregularity and immensity of the overlook, flecked with snow and partly swathed in clouds, resembles a vast, boundless ocean in a state of turmoil. In the mapping room, this chaotic condition soon resolves itself into orderly array: fragmentary mountain ranges, valleys and streams fit together, isolated peaks assume their proper locations, and what was previously a collection of views, chiefly ups and downs, has become an instructive and accurate map showing the various topographical features as a co-ordinate whole, their extent, trend, and altitude, in addition to general geographical information, conveying many meanings of geological interest to those who have the understanding.

There are certain factors necessary to the conduct of a survey such as this, for instance: the triangulation on which the photographic work depends must start from a measured base and be expanded in sufficiently symmetrical proportions; the altitude above sea-level of one or both ends of the base must be known; and there must be independent checks on the expansion of the triangulation at sufficiently close intervals to keep the work within bounds of the limit of accuracy.

In the survey under discussion, the series of traverse lines accurately surveyed by Mr. Cautley's division across each pass furnishes a base from which to start and on which to check. These bases are connected with the Dominion system of land surveys and are as accurately fixed in position as those surveys will permit. The triangulation has been carried on at the same time as the photographing and the stations occupied have been fixed in position by reading horizontal angles, and in altitude by reading vertical angles, from one to the other. Altitudes of stations are derived originally from precise spirit-levelling along the main lines of the Canadian Pacific Railway carried from ocean to ocean. In certain cases independent checks have been made by occupying or sighting upon cairns at stations of the primary triangulation of the Railway Belt through British Columbia, made many years previously.

#### SYSTEM OF CONTROL

The system of control employed is dependent on the Dominion Lands System of Survey. The survey of the Boundary in almost every pass that has been surveyed has been connected with points of this System, and the

latitude and longitude of the monument used as an observation station in each pass has been computed from the tables issued by the Surveyor General's office.

From the surveys of the Boundary, thus established, used as bases, the secondary triangulation system carried over the entire length of the Boundary by Mr. Wheeler has been expanded and checked at each succeeding pass.

Independent checks on his system of triangulation have been made by Mr. Wheeler by azimuth readings taken upon, or from, the various primary triangulation stations of the Railway Belt Survey, made by J. J. McArthur, D.L.S. and W. S. Drewry, D.L.S., as early as 1887.

In that part of the Boundary Survey dealt with in this first part of the Commission's report, namely from the International Boundary to the Kicking Horse Pass, the computations of elevation above sea-level of all monuments and of the mountains between passes that have been occupied as stations by Mr. Wheeler are primarily based on the track elevations obtained by the Canadian Pacific Railway Company in the Kicking Horse and Crowsnest Passes as corrected up to date. In the Akamina Pass the elevation assigned by the International Boundary Commission to their monument No. 272 was adopted as correct. It is interesting to note that the gross apparent error found by Mr. Wheeler when tying on to monument No. 272 in 1915, after having carried his trigonometric levelling survey from Crowsnest Pass—a distance of approximately fifty-three miles in an air line—was one foot.

#### BOUNDARY MONUMENTS

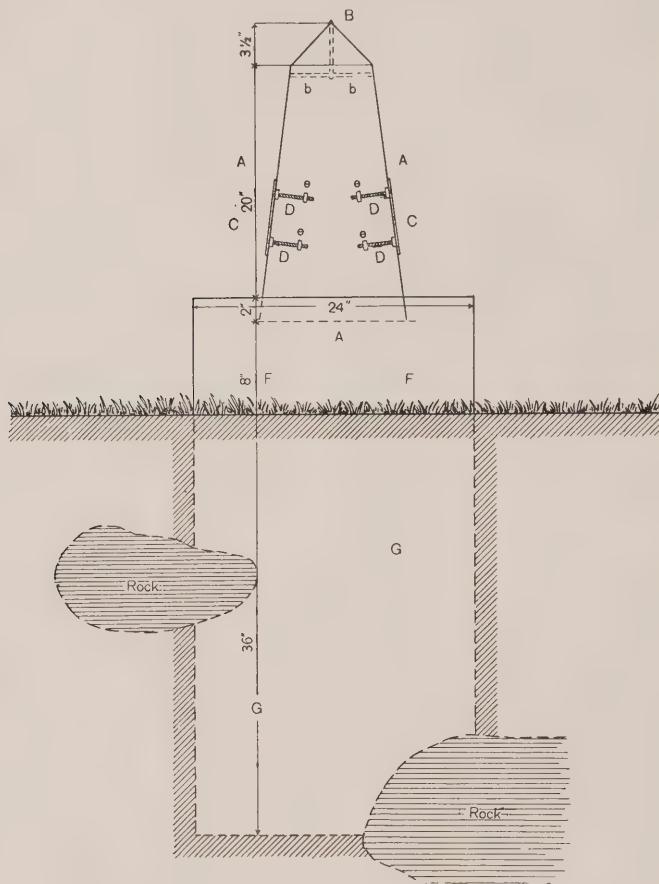
The concrete monument which is erected in the passes was designed by Mr. Wheeler, and, with certain modifications suggested by Mr. Cautley, has proved to be entirely satisfactory.

In essence the monument is a concrete monolith, consisting of a truncated pyramid 20 inches high, of which the bottom cross-section is 12 inches square and the top 7 inches square, having a flattish pyramidal top and set on a base 24 inches square which extends 10 inches above the ground and 36 inches into it.

Its parts may be best described by reference to Fig. 1 as follows:—

- A is a form made of heavy zinc which is filled with concrete and is the permanent outer covering of the top part of the monument.
- B is an iron bar protruding through the top of the zinc form and secured in the concrete by the cross-piece (b);
- CC are brass name plates about 1-8th inch thick, each of which is secured to the monument by four threaded brass bolts—DDDD— $\frac{1}{4}$  inch in diameter and  $3\frac{1}{2}$  inches long. On each bolt there are two nuts, one of which is screwed up so as to hold the brass plate close to the zinc form while the concrete is setting in said form, while the other is left near the end of the bolt—as at eeee—to become embedded in concrete and act as

an anchor. The name plates are deeply etched with the names "ALBERTA" and "BRITISH COLUMBIA," respectively, at the factory, and the number of the monument and characteristic letter of each pass are similarly etched in the field as required.\*



SHOWING CONSTRUCTION OF CONCRETE MONUMENT

FF is the top of the concrete base which is 24 inches square and extends 10 inches above the surface of the ground.

GG is the extension of the concrete base below surface level. Owing to the difficulty of packing lumber in the mountains and the impossibility of

\*The name plates first designed, and used during the season of 1913 in the Kicking Horse, Vermilion and Simpson Passes, were of thin sheet brass with raised letters and figures which were soldered to the zinc form. After the first season's work your Commissioners felt that these were unsatisfactory, and, on their recommendation, dated the 24th February, 1914, they were authorized to procure and use the heavy brass plates described above.

using an underground form more than once, the collapsible form used for the bases is made to extend only two inches below the surface; below this the hole is dug as carefully as possible and filled full of concrete. Wherever it is possible the holes are dug a full three feet deep; where large boulders are encountered their surfaces are washed so that the concrete may form a properly bonded contact with them. In many cases the monument site is situated on rock in place; in these cases all loose or



MONUMENT 5 F IN CROWNEST PASS

partly disintegrated rock is broken away and removed, the interstices are cleaned out and washed and the base is built right on the rock. Fig. 2 illustrates a good example of a monument built in this way; 12 inches of the original surface rock was broken down to secure the foundation for this monument, and its stability is beyond question.

The advantages of this type of monument, as compared with other types which have been used on similar surveys and which have generally taken the form of bronze or cast iron posts, may be stated as follows:—

1. It possesses great solidity and stability, since a monument with a full three foot base weighs about 2700 lbs.

2. It is of such an enduring character that it is impossible to set a limit to its continuance, and it is not subject to destruction or distortion by fire, which is a most important consideration when the fact that nine out of every ten monuments are built in thick woods is taken into account.
3. It costs very much less than a bronze monument half its size would, first because the cost of material is about half the cost of the bronze monument and, secondly, because the cost of transportation is less although the monument itself is so much heavier; this arises from the fact that the material for the concrete monument is capable of being packed piecemeal, and that 4-5ths of it consists of gravel from some comparatively near-by creek bed.
4. The monument is only three feet high above ground level and it is therefore an easy matter to set a transit over it. In view of the great number of surveys which will have to be tied on to this Boundary in the future, and the comparative shortness of some of the courses, this is a most important consideration.

#### CONSTRUCTION OF MONUMENTS

The work of constructing the monuments is practically continuous, for the day after Mr. Cautley's party arrives in a new pass the packers either have to go back to the nearest railway point to bring up cement or to find the nearest available source of good, clean gravel, and this work goes on throughout the time occupied by the preliminary survey and until the last monument is finished.

Owing to the fact that the Boundary is situated on the watershed it is never possible to secure clean gravel on the spot, and it is necessary to get it from some point along one of the creeks running from the pass where the volume of water is sufficient to have caused the formation of gravel beds. Such a point can generally be found within three miles of the pass and at an elevation of from 600 to 1000 feet below it. The gravel is packed up to the pass in cement sacks.

As soon as the Commissioners have determined the number and location of monuments to be built in a pass, the brass name plates have to be etched with the number of the monument and the characteristic letter of the pass.

Each pass surveyed is assigned a characteristic letter, and each monument is marked with a number and with the characteristic letter of the pass in which it is built.

The first pass surveyed by the Commission was Kicking Horse Pass, and it was assigned the letter 'A.' From Kicking Horse Pass it was proposed to continue the work southerly towards the International Boundary and to assign to each succeeding pass towards said Boundary the letter that came next in alphabetical sequence. Thus 'B' was assigned to Vermilion Pass, and 'C' to Simpson Pass; but from Simpson Pass the Commission proceeded

to Crowsnest Pass, and thence southerly to the International Boundary, and it was not until 1915 and 1916 that the work of closing the gap between Simpson and Crowsnest Passes was undertaken and completed. During these two seasons it was found necessary to survey four passes, lying between Simpson and Crowsnest Passes, for which no letters were assigned at the time when 'F' was made the characteristic letter of Crowsnest Pass, so that it was impossible to maintain the alphabetical sequence as originally proposed. The consequence is that the characteristic letter assigned to any pass must be regarded merely as a symbol by which monuments built in that pass are distinguished from those built in any other pass, without any relation between the order in succession of the various passes and the alphabetical sequence of the letters assigned to them.

The monument nearest to the lowest summit of a pass—i.e., the lowest point of its cross-section along the watershed is numbered 1. Proceeding from No. 1, those monuments that are built along the watershed on its course to the north boundary of the two Provinces are numbered consecutively 2, 4, 6, etc., and those that are built on its course to the International Boundary are numbered 3, 5, 7, etc. Thus Monument No. 6F is the third monument on the northerly side of the monument at the bottom of the pass characterized by the letter F, which happens to be Crowsnest Pass.

The brass plates are then bolted to one of the zinc forms and the iron bar, shown as B in Fig. 1, is soldered into position so that it will not move while the form is being filled with concrete. The zinc form is then taken to the monument site, fitted into a heavy wooden case, bottom up, and filled with concrete. On the same day the hole is excavated for the base of the monument in such a position that those sides of the monument which bear the name plates shall be at right angles to the lines which bisects the angle between the two adjacent courses of the Boundary. The monument builder then proceeds to another site so as to allow the concrete in the monument top to set, which, in good weather, only takes 24 hours. Next day the hole is filled with concrete to within two inches of ground level: the wooden form for the base is then set in position, by means of the reference picket set for that purpose, and filled with concrete. The monument top is then turned out of its wooden form and lifted into position on the wet concrete base, where it is worked down to a seat on four small wooden pegs which have been set, and levelled, to receive it two inches below the surface of the concrete in the wooden base form. The surface concrete is then trowelled smooth, and the monument is watched for a while to see that there is no likelihood of subsidence which might cause the top to set out of plumb.\*

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\*At first the practice was to allow both the top and the base to set separately, and then to cement the top on to the base. It was found, however, that, owing to the shrinkage of concrete in setting having already taken place in the base, the rich mixture of cement laid on to cement the top to the base to a depth of two inches did not unite properly, and was liable to crack in setting.

The concrete is made in the proportion of one part of cement to four parts of gravel, and is well mixed and puddled; this mixture is somewhat richer than is ordinarily used, but has been adopted because the body of concrete in a monument is small, requiring greater power of cement than would be necessary in a larger body, and also with the idea of overcoming any defects in the gravel, which is not always as good as what would be used in ordinary concrete construction.

When the concrete has set dry the wooden form is removed from the base, and the zinc cover is painted a bright red. This colour has been adopted by the Commission as being most distinctly visible, both against the green background of summer or the white background of winter.

The equipment necessary for the above work is as follows:—

- 2 heavy wooden forms in which to fill zinc tops.
- 2 sets of wooden forms for bases,
- 2 sets of shovelling boards on which to mix concrete,
- 2 water kegs in which to transport water,
- 2 square-mouth shovels,
- 1 spade,
- 1 pick or crowbar,
- 1 pail,
- 1 mason's level,
- 2 smoothing trowels,
- 1 box nitric acid, beeswax and hellebore, for etching brass plates,
- 1 soldering outfit,
- 1 painting outfit,
- number of cement sacks in which gravel is carried.

#### COST OF MONUMENTS

The cost of each monument may be divided under three heads—material, labour of building and transportation of material, of which the first two may be regarded as constant and the third varies in accordance with the distance of a pass from the nearest railway point from which cement can be brought, and the difficulties of transporting it thence to the pass. Wherever it is practicable Mr. Cautley employs team freighting, both because it is cheaper and also to relieve his pack train, which it may be safely stated is the most steadily worked train in the Mountains, but it has been necessary on occasion to pack cement 75 miles which adds very materially to the normal cost of transportation.

On the basis of charging half the expense of the pack train and half the wages and allowances of the two packers to the monument account, under the head of transportation, and charging as labour of building the actual time of men who are engaged in building monuments, it may be estimated that the actual construction of each monument costs from \$30.00 to \$40.00, as follows:—

To material for one monument.....	\$11.50	\$11.50
“ labour of building.....	4.50	4.50
“ transportation of material by rail and horse.....	14.00 or	24.00
 Total cost of each monument.....	 \$30.00 or	 \$40.00

#### BOLT AND CAIRN MONUMENTS

From the commencement of the survey until the end of the season of 1915 the bolt form of monument used by the Commission consisted of a solid brass bolt with a shank 4 inches long, of the form and dimensions shown in Fig. 3.

It was stamped by means of steel dies with the words "ALBERTA" and "BRITISH COLUMBIA" on the longer sides, and with the number and characteristic letter of the pass on the shorter sides, or ends. A "+" was stamped in the centre of the upper face, or top.

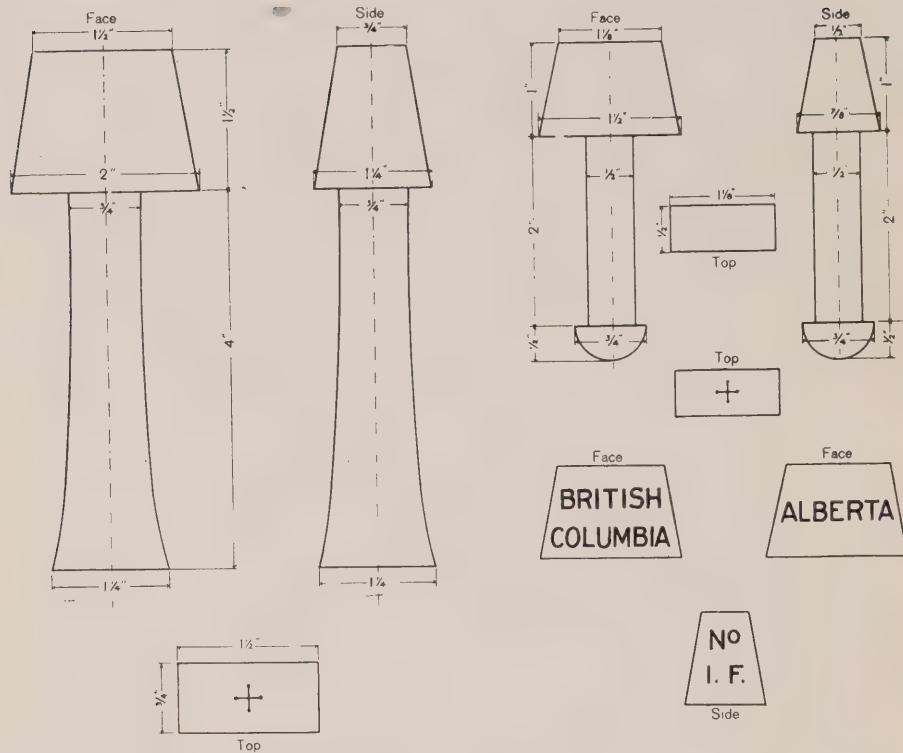
The bolt is set in cement in a hole drilled for that purpose in the solid rock. In some few cases, however, solid rock was not to be had and the bolt has been set in the largest available loose boulder.

The position of the bolt is marked by the erection over it of a rock cairn with five-foot base and from five to seven feet high, depending upon the amount of material at hand. A photograph or photographs of the cairn and description of its location serve to identify the spot where the bolt has been placed.

The bolt weighs 2 lbs. and it requires a  $1\frac{1}{4}$  inch drill and 5 lb. sledge to make the hole in which it is cemented.

In many cases the rock is of a rotten, friable character and the making of a hole with so large a drill frequently results in splitting and chipping. The weight also of the sledge, drill, bolt and cement, together with the surveying instruments has proved highly detrimental when making difficult climbs to selected points.

For the above reasons it has been decided to reduce the dimensions of the bolt to those shown in Fig. 4.



BRASS BOLT USED DURING THE SEASONS OF  
1913, 1914 AND 1915

BRASS BOLT USED SINCE 1915

### THE USE OF BOLT AND CAIRN MONUMENTS

Bolts and cairns are used as monuments of the Boundary Survey in three ways, as follows:—

1. It may be necessary to use a bolt to mark the intersection of two straight line courses of the Boundary. Bolt 4 B in Vermilion Pass may be cited as an example of this case. This Bolt is considerably below timber line, and its location is quite suitable for the erection of a concrete monument, but a precipitous rock bluff, about 700 feet high and extending right across the line for a considerable distance on either side of it, made the transport of monument material impracticable.
2. Usually the last straight line course on either side of a pass is terminated by a bolt and cairn, because the terminal point selected by the Commission is generally inaccessible to horses. This is due to the feeling of the Commission that the straight line boundary should be carried beyond timber line to some prominent terminal point whence the position of the natural boundary, or watershed, is clearly defined, in all cases where such a line can be found which fairly conforms to the watershed.

3. Beyond the last course of the straight line boundary Mr. Wheeler uses bolts to mark dominating points of the watershed in the immediate vicinity of the passes. These bolts are used by him as triangulation stations, and are closely connected with all other monuments of the survey.

Bolts set under this heading are always set on the actual watershed, but the Boundary between such bolts, and the continuation thereof beyond the last bolt set, is the natural watershed as established by photographic delineation.

The cairns built over bolts are all photographed, and the photographs are included in Appendix I of this report.

Since the position of bolts and cairns is accurately determined by the Commission, in relation to the other monuments of the Boundary survey, and to the points of the Dominion Lands System connected therewith, and the cairns are generally visible for miles on either side of a pass, it is possible for a surveyor employed to make land surveys within a reasonable distance of a pass to tie on to the Boundary survey by methods of triangulation, without going to the great labour involved in running a traverse up to the Boundary. In view of the facts (a) that it is of the greatest importance that all isolated surveys should be connected with some survey of which the relative position to the general survey system of the country has been established, and (b) that almost all the concrete monuments of the Boundary survey are situated in thick woods, and that it is difficult to tie on to them by the employment of trigonometric methods for that reason, it is considered probable that these outlying bolts of the pass surveys will be found very useful, and will be extensively used in the years to come.



## CHAPTER III

### SURVEYS EXECUTED IN 1913

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#### DESCRIPTION OF OPERATIONS

The survey of the Boundary across the passes in the manner indicated by the instructions from the Surveyor General of Dominion Lands, quoted at the beginning of Chapter II, involved a number of problems that had to be worked out. For this reason a beginning was made at Kicking Horse Pass. The Pass was easy of access by rail, presented slopes largely denuded of green timber by fire and lumbermen and contained, close at hand, a supply of material for experimenting with concrete monuments.

On completion of this first survey, having ascertained the most practical methods of conducting the work, a move was made to Vermilion Pass and then to Simpson Pass, the next two passes named in the instructions, in rotation southward.

At the close of the survey at Simpson Pass it was too late in the season to move to White Man Pass, owing to the difficulties of transport in reaching it, so Mr. Cautley moved his party by rail to Crowsnest Station on the south line of the Canadian Pacific Railway and commenced a preliminary survey of Crowsnest Pass, completing about one-third of the distance to be covered by such survey.

The season was then too far advanced to begin topographical work in Crowsnest Pass so Mr. Wheeler's party extended the Simpson Pass survey southward along the main divide to Mt. Assiniboine, and ascertained the location of the line of watershed and the whereabouts and nature of several other passes that have not, heretofore, been officially recorded or named.

#### KICKING HORSE PASS

*History and Origin of Name.*—The Kicking Horse Pass is the route by which the transcontinental line of the Canadian Pacific Railway travels across the main range of the Rocky Mountains. It is about forty miles west of Banff and its lowest summit lies at an altitude of 5320 feet above sea-l. vel.

The pass was discovered in 1858 by the late Sir James Hector (at that time Dr. Hector), geologist to the Palliser expedition. He travelled up the Bow River to a point near Castle Mt.; then by way of Little Vermilion Creek, flowing northeasterly, to the crossing of the Great Divide, known as Vermilion Pass, near the headwaters of Vermilion River. He then followed Vermilion River to its junction with the Kootenay River and up the valley of that

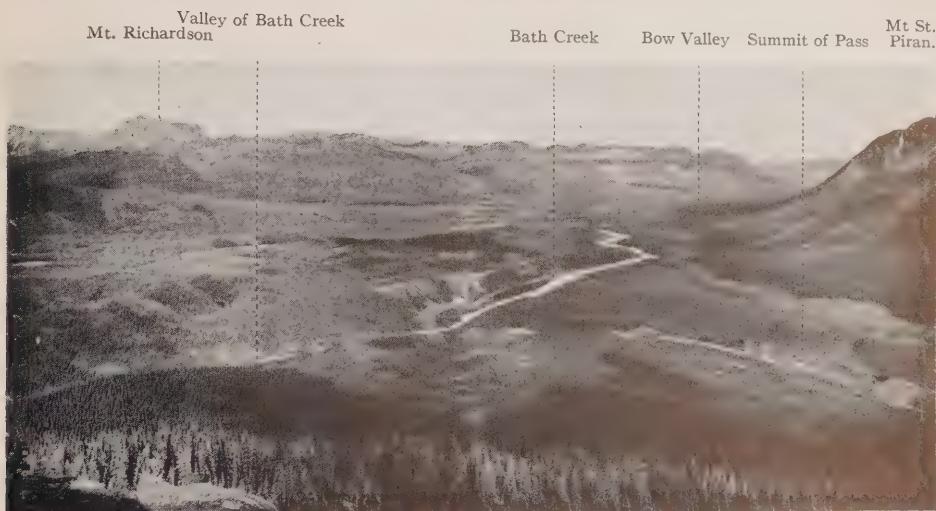
stream to the divide between it and the Beaverfoot Valley, following the latter to its junction with Kicking Horse Valley.

It is recorded that on the journey Dr. Hector and his party suffered much from want of food, owing to the difficulties experienced by his hunters in obtaining game. Near the confluence of the Beaverfoot and Kicking Horse Rivers he received a severe kick from a pack-horse, which disabled him for a day. At the end of that time, owing to the necessities of hunger, he managed to push on up the latter stream and reached the summit of the main range by that route. In reference to the accident, an account of which is found in Hector's diary, the names Kicking Horse River and Pass have been perpetuated. They appear for the first time on the map accompanying the Palliser Reports, presented to the British Government under date, 19th May, 1863.

In 1871 the Crown Colony of British Columbia joined Confederation. By the terms of the union the Canadian Government undertook to complete a through line of railway to connect the sea-board of British Columbia with the Atlantic sea-board within ten years from the date of union. From 1871 to 1879 the late Sir Sandford Fleming, as Engineer in Chief of the Canadian Pacific Railway, carried on surveys to obtain a suitable low-level line of location. By the year 1880 a line had been located, extending across the prairies, from Selkirk on the Red River to Edmonton on the North Saskatchewan and thence, via the Yellowhead Pass and Thompson and Fraser Rivers to the Pacific Coast. However, events occurring during the year changed the entire course of the road from the Red River westerly and placed it in its more southerly location through the Kicking Horse Pass. In the year 1880 the Canadian Pacific Railway Company was formed under the leadership of Mr. George Stephen (now Lord Mount-Stephen), Mr. Donald A. Smith (the late Lord Strathcona and Mount-Royal), Mr. James Hill and others. Mr. W. C. Van Horne (the late Sir William Van Horne, K.C.M.G.) was appointed general manager and Major A. B. Rogers, Engineer in charge of the mountain division. It was decided to adopt the Kicking Horse Pass route as the one of shortest alignment from the prairies to the Pacific Ocean. The surveys were completed during the winter of 1882-83. On the 7th November, 1885, the last spike was driven at Craigellachie and, on the morning of the 8th, the first through train of the first transcontinental railway arrived from Montreal on the Atlantic sea-board at Port Moody on the Pacific. The route lies through the grandest of Rocky Mountain scenery and has become renowned the world over. The very best of such scenery is in close proximity to the Kicking Horse Pass.

*Topography of the Pass.*—The pass is a valley leading through the main range in a practically east and west direction. At the summit it is a little over two miles wide between the limestone escarpments on either side, that on the south being precipitous and that on the north of very steep slope. The intervening space consists of benches at various levels, terminated by steep slopes rising to the limestone escarpments.

The approach of the railway from the east is on a long easy grade up the wide, shallow valley of Bath Creek, which it leaves shortly before reaching the summit of the pass to follow the main valley through the range. On the west side the drop is more rapid. Three miles below the summit, after leaving Wapta Lake at Hector Station, the railway enters the gorge of Kicking Horse Canyon and descends the "big hill" to Field Station—a stretch of seven miles. The original maximum grade over this portion was 4.8 per cent. Formerly, it took from two to four extra powerful engines to haul loaded trains up and, even then, they had to be divided into sections. Now, two spiral tunnels, one 3200 feet long and the other 2800 feet, have been cut through the slopes of Mts. Cathedral and Ogden, and the maximum grade has been reduced to 2.16 per cent.



KICKING HORSE PASS, SHOWING EASTERN APPROACH

The watershed is the dividing line between the head waters of a small stream which, rising in a glacier to the south between the shoulders of Popes Peak and Mt. Niblock, turns easterly close to the summit of the pass, and the head waters of Kicking Horse River, which rise close to the summit and flow westerly, via Summit Lake, to Sink Lake. From the latter there is no surface flow, its drainage appearing in springs near Wapta Lake. The principal source of Kicking Horse River is Cataract Brook, flowing from Lake O'Hara. It drains a very considerable basin surrounded by high mountains and holding large deposits of snow and ice. Kicking Horse River flows westerly to the Columbia River, which it joins at Golden, some forty-five miles farther west. On this side the course of the water flowing to the Pacific Ocean is through these two rivers only, while to the east the course is through streams of many different names before Hudson Bay is finally reached. First there is the small

glacier stream which joins Bath Creek after a mile or so, then Bath Creek for three miles to Bow River; Bow River carries the water many miles to the South Saskatchewan and the latter, uniting with the North Saskatchewan to form the Saskatchewan River, flows over a long course to Lake Winnipeg from which the water discharges by Nelson River to Hudson Bay. (See Atlas, Sheet 16).

At the summit an artificial diversion has been made of the water of the glacier stream, which originally flowed wholly to the east. This diversion has been arranged by the Canadian Pacific Railway by the construction of two concrete channels, one curving to the east and the other to the west. An artistic rustic sign marked "The Great Divide" completes a realistic presentation of the division of the waters.

The benches and slopes at lower levels of the summit of the pass have been practically denuded of forest by the action of fire and removal of material for railway purposes, and are now littered with brûlé and windfall interspersed with second growth pine and spruce. The steep slopes on both sides are partially covered by a fairly heavy growth of spruce and pine. In fact, the pass for several miles on both sides of the summit has been subjected to the ravages of forest fires and what green timber exists is for the most part second growth pine with scattered bunches of spruce.

Three small lakes are in close proximity, viz: Summit Lake, a small pond of water a quarter of a mile west of the summit of the pass, Ross Lake, a picturesque little tarn in a pocket below the north shoulder of Popes peak, and Lake Minewakun set high in a rock-bound amphitheatre between Mts. Niblock and St. Piran.

*Boundary Line.*—On the 23rd June, Mr. Cautley arrived with his party at Kicking Horse Pass and commenced work. Mr. Wheeler's party, in charge of his assistant, Mr. A. J. Campbell, D.L.S., had been engaged there at preliminary work from the 6th of the month, while organization was being completed by the Commissioners.

The escarpments above referred to as forming the confines of the pass at the watershed are shoulders from Mt. Bosworth on the north, extending easterly, and Popes Peak on the south, extending northerly. Mt. Bosworth, altitude 9083 feet, and Popes Peak, altitude 10,360 feet, are, respectively, the dominating peaks on each side of the pass. The pass is designated by the letter "A."

Monument 1A is near the centre of the pass, at a point about 1.50 chains south of the railway track and 1.80 chains west of the "Great Divide" sign. To the north of Monument 1 A are Monuments 2 A, 4 A, and 6 A. The last straight line course on the north side of the pass extends from Monument 6 A and is terminated by a brass bolt marked 8 A, over which a stone cairn was erected. To the south of Monument 1 A are Monuments 3 A, 5 A, 7 A and 9 A. The last straight line course on the south side of the pass extends from

Monument 9 A and is terminated, above timber line, by a brass bolt marked 11 A, over which a stone cairn was erected.

The total number of concrete monuments erected in the pass was eight and the total length of straight line boundary surveyed was 246.29 chains. Direct connection was made with the south boundary of Section 2, Township 29, Range 17, west of the Fifth meridian, which crosses the boundary between Monuments 5 A and 7 A. At the end of the report will be found views of the several concrete monuments erected, but, as each monument has been built according to the specifications set forth in Chapter II, no special description of them has been appended.

East Shoulder of Mt. Bosworth

Great Divide Sign



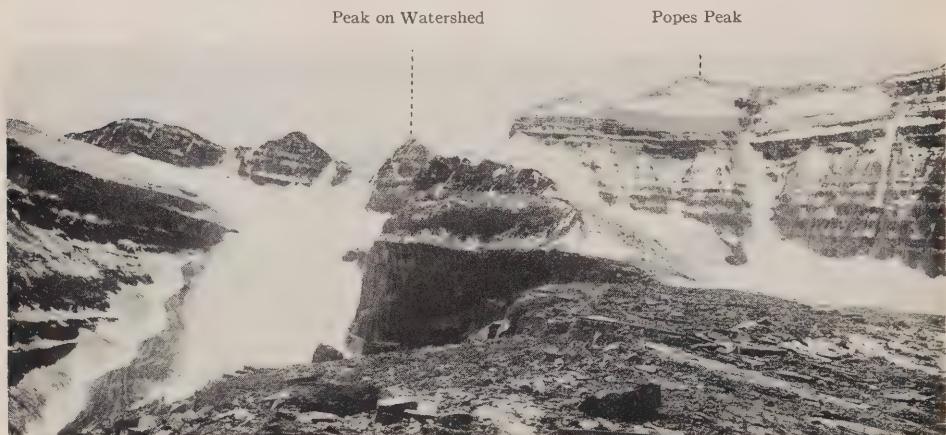
SUMMIT OF KICKING HORSE PASS  
Looking North

Brass bolts were placed at three points along the watershed on the south side: Bolt 11 A is a short distance above timber line and below the first rock precipice. Bolt 13 A is on the north end of the shoulder above referred to as extending northward from Popes Peak and is directly above the same precipice. From 13 A southward the divide line is the apex of a narrow ridge leading back to a minor peak from which a snow saddle connects with the rock and ice cliffs of Popes Peak. The watershed line climbs these cliffs to the crest and Bolt 15 A is placed on the summit of the mountain.

The points above referred to were occupied with the camera and transit-theodolite and connection made with the monuments built by Mr. Cautley's

division. Rock cairns were built over all bolts placed on the watershed. In addition camera stations were occupied on the north shoulder of Mt. Niblock, on the northwest corner of the north shoulder of Popes Peak, on an outlying shoulder of Cathedral Mt. and on an advanced peak of the same mountain, rising on the west side of the valley of Cataract Brook, which was named "Vanguard."

On the north side of the pass bolts were placed at three points also, viz:—8 A on a steep slope just at timber line, 10 A on a projecting corner of the eastern ridge of Mt. Bosworth Shoulder and 12 A on the summit of the mountain, which presents a forbidding, precipitous face on the northeast side overlooking the valley of Bath Creek. A supplementary camera station was occupied on the crest of the eastern extremity of Bosworth Shoulder.



LOOKING SOUTH TOWARDS POPES PEAK FROM BOLT 13 A

For position and altitude of monuments, bolts and their cairns, and camera stations, as well as for general topography and other information, see Atlas, Sheets Nos. 16 and 16 A. At the end of the report will be found descriptions of the locations of the several bolts and views of their cairns; also a table of latitudes and departures referring them to the nearest concrete monuments.

Work was completed at Kicking Horse Pass on the 17th July.

#### KICKING HORSE PASS TO VERMILION PASS

Following the line of watershed, the distance from the summit of Kicking Horse Pass to the summit of Vermilion Pass is roughly speaking thirty miles. The watershed lies along the crest of a serrated ridge forming the apex of the range and rising in numerous high and more or less isolated peaks of very varied form.

There are three distinctly marked gaps in this ridge: Abbot Pass, Wenkchemna Pass and Boom Lake Pass. The area it dominates on both sides may justly be classified as a climax of Rocky Mountain scenery and is a most popular tourist resort.

From Popes Peak northerly, outlying spurs of Mt. Niblock, on the east and Narao Peak on the west extend in horseshoe form, divided in the centre by the ridge of the watershed. They embrace two small glaciers. That below Mt. Niblock is the source of the small stream previously referred to as diverted by the Canadian Pacific Railway, the other drains to Ross Lake. Southerly, the watershed traverses the very broken crest, known locally as the Victoria Ridge. It culminates in the summit of Mt. Victoria at 11,355 feet altitude above sea-level and then descends to Abbot Pass, a narrow gap between Mts. Victoria and Lefroy, 9,588 feet in altitude at its lowest part. Beyond, it rises to the crest of Mt. Lefroy, 11,220 feet.

On the east side of the Victoria Ridge and Mt. Lefroy lie the valleys of the Victoria and Lefroy Glaciers and the celebrated Lake Louise with, close by, the smaller and delightfully picturesque Lakes Mirror and Agnes, known as the "Lakes in the Clouds." These valleys are bounded on the east by the very striking heights of Mts. Mitre, Aberdeen and Fairview. At the lower end of Lake Louise the Canadian Pacific Railway has built and operates a magnificent chateau to which thousands of tourists come during the summer. The Victoria Glacier leads by way of a narrow defile, hemmed in by precipices and set with cliffs and hanging glaciers, to Abbot Pass. The defile is known as the "Death Trap" owing to the fact that avalanches sweep it from side to side. The pass can only be crossed by mountaineers.

The opposite side leads to Lakes Oesa and O'Hara, wonderfully beautiful glacial lakes of different types, embraced by the heights of Mt. Yukness on the south and Mt. Huber and Wiwaxy Peaks on the north. The valley of Cataract Brook, the head waters of Kicking Horse River, lies on the west side of Victoria Ridge.

From Mt. Lefroy the watershed traverses the main ridge southward to Mt. Hungabee (The Chieftain), 11,447 feet. It is the central peak of the region and one from which five distinct valleys radiate, all famous for their scenic beauty. Below on the east is Horseshoe Glacier at the head of Paradise Valley, and on the west the heads of the valley of Cataract Brook and of Prospectors Valley, separated by the glacier-crowned Opabin Pass.

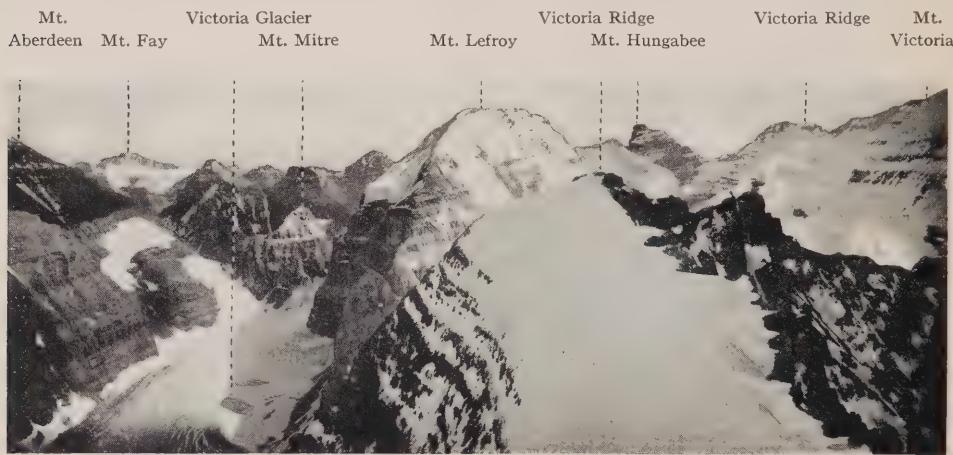
From Mt. Hungabee the watershed line drops to Wenkchemna Pass, 8,521 feet, at the head of the Valley of the Ten Peaks which lies to the northeast. This valley contains the well known Moraine Lake and is separated from Paradise Valley by Eiffel Peak, Pinnacle Mt. and the great mass of Mt. Temple, 11,626 feet. Wenkchemna Pass can only be crossed by way of the Wenkchemna Glacier. It is a mountaineer's pass.

The watershed line here turns from a generally southerly direction to a southeasterly one and, rising to the summit of Mt. Deltaform, No. 8 of the

Ten Peaks, 11,225 feet, follows their crests to the summit of Mt. Fay, No. 1, where it again assumes a southerly course.

North of Mt. Fay is the outlying spur of Mt. Babel, and the isolated rock monolith known as "The Tower of Babel." Consolation Valley and its two beautiful little lakes lie on the northeast side of this section of the watershed. On the southwest side is Prospectors Valley, drained by Tokumm Creek, a tributary of Vermilion River. Both Moraine and Consolation Lakes are stocked with small trout.

Winding between glaciers the watershed soon resumes its southeasterly direction and arrives at Boom Lake Pass, approximately 7,500 feet in altitude. The pass can only be reached from the north by crossing a glacier, and is suitable for foot travel alone. It leads on the south side to the head waters



THE VICTORIA RIDGE

Panorama, Leaf No. 1

of Vermilion River. Rising from the pass the line follows the crest of Boom Mt. and then falls in a nearly south direction to the summit of Vermilion Pass.

Immediately north of Boom Mt. is a very picturesque lake of the same name, enclosed by high mountain spurs. It is the source of Altrude\* Creek which joins the Bow River near Castle Station on the Canadian Pacific Railway.

For general information see Atlas, Sheets Nos. 14 and 15.

\*Shown on sheets 14 and 14 A as Little Vermilion Creek. The correct name is Altrude Creek.

## VERMILION PASS

*History and Origin of Name.*—The Vermilion Pass is the first pass southeast of Kicking Horse Pass suitable for a main line of travel across the range. It is distant from it nineteen miles in direct distance and is seven miles southwest of Castle Station on the Canadian Pacific Railway. The altitude adopted by the Commission for its lowest summit is 5,376 feet above sea-level, nearly the same as that of the Kicking Horse Pass.

Some six miles southwest of the pass are mineral springs of which iron oxide is a large component. The deposits from them form ochre beds of yellow, orange and red colours, situated a few hundred feet back from the

Mt. Victoria

Victoria Ridge

Mt. Odaray



THE VICTORIA RIDGE

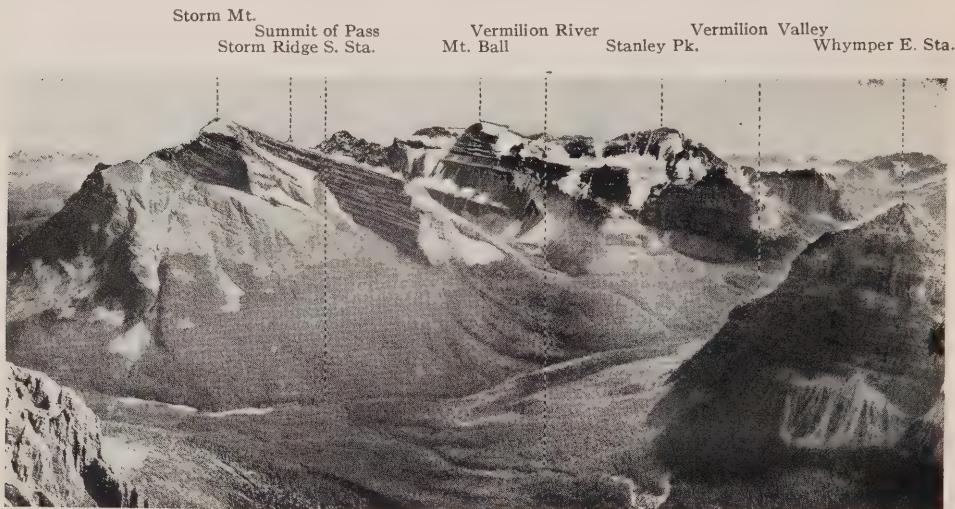
Panorama, Leaf No. 2

Vermilion River on its western side, and cover an area of fifteen to twenty acres. They are of historic interest from the fact that they have, in times gone by, been the rendezvous of Indian tribes, who came there to gather material for war paint and other decorative purposes. The extensive remains of old tepee poles in the vicinity indicate that a large number of Indians used these deposits, and it is likely the Vermilion River derived its name from them.

In 1858, Sir James Hector, while exploring for the Palliser expedition, traversed the pass and descended the Vermilion River Valley to the Kootenay Valley on his circuitous route to the discovery of the Kicking Horse Pass. As already stated, he travelled from the Bow Valley up Altrude Creek. His expedition is the first recorded travel over the pass by white men, although it had undoubtedly provided a path across the main range for

the Kootenay and other Indians prior to that date. The name appears for the first time in Palliser's map, previously referred to.

The pass is of special importance owing to the fact that the British Columbia, Alberta and Dominion Governments and the Canadian Pacific Railway have joined forces to construct a main road, suitable for motor travel, over it from Banff on the Bow River to connect at Windermere on Columbia River with the main trunk road from Golden on the Canadian Pacific Railway to Fort Steele on the Kootenay River. On the British Columbia side work has proceeded in both directions, from Windermere north and from Vermilion Pass south. On the Alberta side the road is practically completed up the Bow Valley and is serviceable for travel from the Bow River crossing to the summit of the pass.



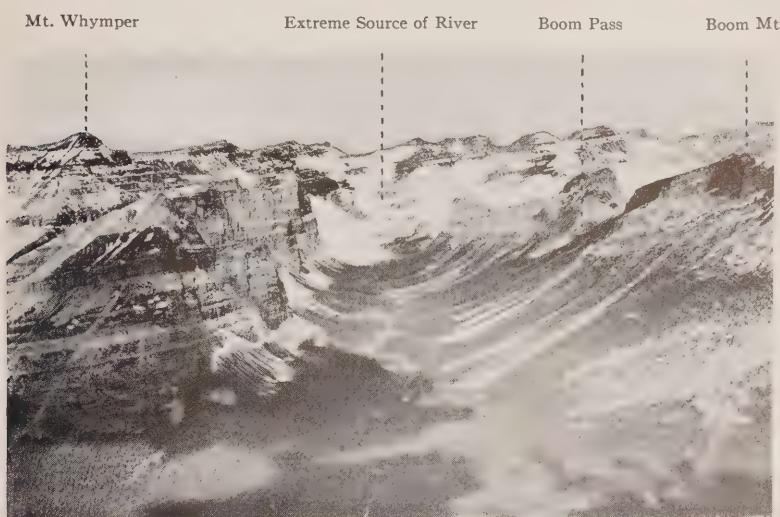
SUMMIT OF VERMILION PASS

*Topography of the Pass.*—Vermilion Pass lies in a northeast and southwest direction. Its summit is the dividing line between waters flowing to Vermilion River, a tributary of Kootenay river and those flowing to Altrude Creek, a tributary of Bow River. A chain of small and picturesque lakes, one of which is almost at the summit, lies in the valley of the pass on the northeast side between it and the main flow of the creek. The lowest one, Vista Lake, is specially attractive and, together with Boom Lake and Altrude Creek of which it is the source, furnishes good trout fishing.

Vermilion Pass summit differs in many respects from Kicking Horse Pass. It is steeply walled on the east side by an outlying shoulder of Storm Mt. and on the west side by a shoulder of Boom Mt., the two dominating peaks of the pass, and is thickly clad with green forest for a considerable distance on both sides of the centre. The slopes are steep, fairly regular

and rise directly from the pass summit. The air line distance from crest to crest of the two shoulders is very nearly two and a half miles. A little more than half a mile below the crest of Boom Mt. shoulder a bold rock escarpment traverses it parallel to the pass at a nearly uniform elevation. Beyond, the watershed line follows the ridge along a clearly defined natural boundary to the summit of Boom Mt. On the other side of the pass the watershed line follows a well defined ridge eastward and southward to the summit of Storm Mt.

The extreme source of Vermilion River is in a deep, narrow valley directly south of Boom Mt. It is remarkable for the great rock bastions that stand out on the south side. Large deposits of snow at the head and in the pockets



SOURCE OF VERMILION RIVER

of the south wall furnish the supply. From the source to near the summit of the pass the river flows southeasterly. It then turns at a right angle and flows southwesterly for some seven miles when it again turns southeasterly. Mt. Whymper, 9321 feet, stands in the angle made by the two courses of the stream. The Banff-Windermere road follows the stream closely, crossing it at the turn near the summit and again from west to east before reaching the second turn.

*Boundary Line.*—Mr. Cautley's party arrived on the 18th July. The pass is designated by the letter "B." Owing to its nature and the lay of the watershed line only three courses and four concrete monuments were necessary. At the summit the line is clearly defined by a rock ridge which crops out above the soil.

Four concrete monuments were built and four brass bolts were placed to mark the position of the straight line courses. Monument 1 B is at the summit of the pass at a point on the southerly limit of the automobile road. On the northwesterly side of the pass, Monument 2 B was built as an interim monument on the first straight line course, but it was found impracticable to transport material to build a monument at the point of deflection forming the end of this course, on account of the precipitous rock escarpment referred to above, which is here about 700 feet high and extends across the line for a considerable distance on either side of it. This point, therefore, was terminated by a brass bolt, marked 4 B, and a cairn was built over it.

On the southeasterly side of the pass the boundary was established as a single straight line course, marked by two interim concrete monuments, Nos. 3 B and 5 B, and terminated on the summit of the ridge by a brass bolt, marked 7 B, over which a cairn was built. The total length of straight line boundary established in Vermilion Pass was 218.84 chains. At the end of the report will be found views of the several concrete monuments erected.

In all seven brass bolts were set in place and rock cairns erected over them, viz: 4 B, 6 B, 8 B, and 10 B on the west side of the pass and 7 B, 9 B and 11 B on the east side. Of the first four, 4 B was placed on the crest of the horizontal escarpment previously referred to, 8 B on the shoulder of Boom Mt. and 6 B nearly midway between the two; although locations of 4 B and 6 B were not above timber line it was, as stated, found so difficult to convey material for concrete monuments that brass bolts and cairns were decided upon. Bolt 10 B was placed on the summit of Boom Mt. Of the other three, 7 B was placed on the crest of the shoulder extending north and west from Storm Mt., 9 B on a commanding point about half a mile northeastward along the same crest and 11 B on the summit of Storm Mt., 10,332 ft., close beside the large cairn marking the position of Station No. 14 of the primary triangulation of the Railway Belt of British Columbia.

A joint triangulation was made by the two divisions to connect the boundary survey with the northeast corner of Section 36, Township 26, Range 15, west of the Fifth meridian.

Camera Stations were occupied at the north end of the outlying shoulder of Storm Mt., at two points on Mt. Whymper, at Storm Ridge S. and on Stanley Peak. For position and altitude of Monuments, bolts and their cairns and camera stations, as well as for general topography and other information, see Atlas, Sheets 14, 14A and 15.

At the end of the report will be found descriptions of the locations of the several bolts and views of the cairns over them; also a table of latitudes and departures referring them to the nearest concrete monuments.

Work was concluded here on the 13th August, when Mr. Cautley's party left Vermilion Pass for Simpson Pass by a trail shown as following Vermilion River to its junction with Simpson River, and up that stream and a northerly

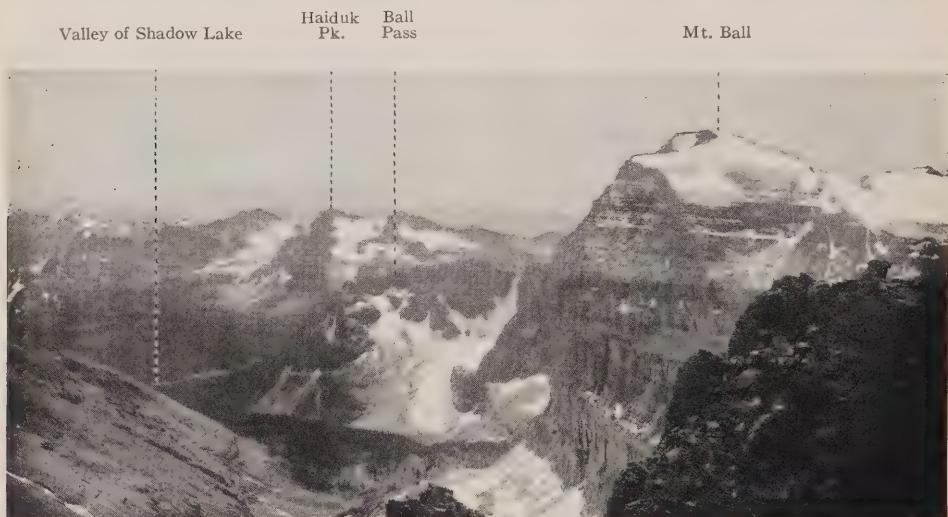
branch of the same to the pass. The Banff-Windermere road was under construction for about six miles, but beyond that the trail was found to be much overgrown and entirely obliterated in places until Simpson River was reached, after which it was fairly good. The rivers were very much swollen with continuous heavy rains and, on the first day out—the 13th—Mr. Cautley was unfortunate enough to lose some instruments, owing to the horse on which they were packed having lost his footing while fording the Vermilion River and being carried down stream into deep water; the horse was saved but the pack had become loosened by his struggles and the instruments were lost. This accident necessitated Mr. Cautley's return to Edmonton for a new instrument and he was only able to rejoin his party at Simpson pass on the 23rd August. During his absence the party was in charge of Mr. A. J. Campbell.

In this connection it may be interesting to point out that a great many trails shown on existing maps are in very poor condition, and are often impassable until a great deal of work has been done cutting out wind-fallen timber, etc. There can be no doubt that many of these trails have been much travelled in the past, but the coming of the railways and the consequent diversion of freight routes along them, and from them by roads and trails built in reference to them, has caused the practical abandonment of the older trails. In the meantime, any trail, the existence of which has at any time been authenticated by surveyors, packers, prospectors or other travellers, and which has once been marked on the maps of a district, is reproduced on each succeeding issue of such map without further knowledge of the present-day condition of such trail. The result is that intending travellers may regard all trails shown on existing maps as practicable routes of travel, but should not take it for granted that they exist as passable trails for horses without careful local enquiry. Even a trail that has been well located and cut out very soon becomes impassable for horses owing to fallen timber, since trees have no depth of root growth on densely timbered mountain sides and are very easily overthrown by heavy wind or weight of snow. One way to keep the mountain trails in good condition would be to maintain a few trail foremen, each with one assistant and a few pack ponies who would each be given an annual circuit of two or three hundred miles of trail.

#### VERMILION PASS TO SIMPSON PASS

The direct distance from Vermilion Pass to Simpson Pass is slightly over fourteen miles; following the watershed line it is approximately twenty-six. The part of the continental watershed that lies between is over a series of high peaks and ridges, known as the Mt. Ball group. Two minor passes, Ball Pass and Redearth Pass, divide it into three distinct sections. There is a third small pass about one and a half miles southwest of Redearth Pass summit, but it lies well above timber line and is only possible for foot travel; its summit is immediately south of Mummy Lake and the approach from either direction is very steep.

On leaving Vermilion Pass summit the watershed line ascends to the crest of the north shoulder of Storm Mt. and follows the ridge in a roughly semi-circular curve around the north and east perimeter of a rock-walled amphitheatre containing two little glacial lakes tributary to Vermilion River. It then, in a nearly south direction, ascends to the summit of the bold, isolated peak of Storm Mt. At the eastern base of the mountain, on the Alberta side, lie the Twin Lakes, charming little tarns of a brilliant blue, well stocked with trout. The same direction is continued to the camera station, Storm Ridge S., when the line swings southwest on an erratic course to the spur, extending northwesterly from the main crest, which culminates in Stanley Peak; then, turning at nearly a right angle, it follows the crest to the summit of Mt. Ball, 10,825 ft., the dominating peak of the group. From Mt. Ball the course is due south to Isabelle Peak, 9600 ft., and then nearly due east to Ball Pass.



EAST FACE OF MT. BALL

The summit of Mt. Ball is clad with perpetual snow. Its east face is a precipitous rock escarpment falling nearly 4000 feet to the valley of Shadow Lake; in fact the whole east face of the group shows a similar escarpment, lined and hung with pocket and cliff glaciers and beds of snow set high on the ledges.

On the west side of the watershed, six great spurs reach out prominently into the Vermilion Valley, the most northerly being the shoulder of Storm Mt., along which the watershed line lies, and the most southerly terminating in Vermilion Peak, 8682 feet, where the southwestern slopes of the group become more uniform and rise directly above Vermilion River. The river, circling around Vermilion Peak, departs from its previous southwestern course and assumes one directly southeast to its junction with Simpson River. Deep.

well-timbered valleys, lined with glaciers, lie between these spurs and furnish a magnificent setting of snow, ice, rock precipice and green forest.

Shadow Lake, one mile long by a quarter wide, is situated directly below Mt. Ball on the east side. It is of a rich blue colour, collects the run-off from a large amphitheatre enclosed by Storm Ridge south and Mt. Ball, and is the principal source of Redearth Creek, a tributary of Bow River.

Ball Pass has an altitude of 7300 feet. Water flows from it on the north side to Shadow Lake and on the south by way of Hawk Creek to Vermilion River. It may be possible for travel with horses.

Monarch Mt.



SUMMIT OF REDEARTH PASS  
Looking Southeast

Between Ball Pass and Redearth Pass the Divide ridge continues south-easterly with similar characteristics, except for the separation of a small portion of its extreme end by the gap of Mummy Lake, beyond which the watershed line runs nearly north for three-quarters of a mile to the summit of a peak directly south of Egypt Lake. From this peak it descends southeast and east to the summit of Redearth Pass. The ridge culminates in Haiduk Peak at 9540 feet.

Below the northeast escarpment, a valley parallel to the direction of the watershed separates the ridge of the Pharaoh Peaks. A height of land, 7500 feet, divides the valley into two parts, one containing Haiduk Lake and draining

northward to Shadow Lake, the other receiving the waters of Scarab and Mummy Lakes which descend by a picturesque fall of about 100 feet to Egypt Lake, and supply the most southerly branch of Redearth Creek. The Pharaoh Peaks are a prominent and striking feature of the landscape from the north and east. Three small lakes lie beneath their eastern precipices.

South Pharaoh Pk.



SUMMIT OF REDEARTH PASS  
Looking Northwest

Southwest of the Divide are the head waters of Hawk and Verdant Creeks, separated by a spur ridge which extends westward from the first peak northwest of Haiduk Peak and sweep around in a circular curve, forming the bounding slopes of the Vermilion Valley and rising in a series of peaks to a greatest altitude of 9330 feet at Folding Camera Station. Between this ridge and the

watershed ridge lies the valley of Verdant Creek, a tributary of Simpson River, which it joins some miles above the junction of that stream with Vermilion River.

The altitude of Redearth Pass is 6770 feet. It is a rocky defile from which water flows on the north side to the south branch of Redearth Creek and on the south to Verdant Creek. The summit lies below timber line and the pass would seem to afford a possible route for travel with horses. A branch trail from the existing trail up Redearth Creek over the pass would connect with the trail up the Simpson Valley from the Banff-Windermere Road and would furnish a magnificent scenic tourist route.

East of Redearth Pass the watershed line ascends directly to the crest of a rock escarpment, extending northwesterly from Monarch Mountain. It then turns southeast and connects with Mr. Cautley's survey of Simpson Pass at Concrete Monument No. 14C, altitude 7926.5 feet, built on the highest part of the ridge.

To effect the survey of this portion of the watershed the following camera stations were occupied:—Shadow Lake, 8186 ft., Redearth N., 8615 ft., Redearth, 8414 ft., Pharaoh Pk. N., 8820 ft. and Pharaoh Pk. S., 8895 ft.

During the summer of 1913, Mr. R. D. McCaw, D.L.S., made a phototopographic survey of the country contiguous to the Banff-Windermere road location for the British Columbia Government. The information obtained by him at a number of camera stations on the west side of the watershed has been utilized by the Topographical Division in the production of the maps accompanying this report, namely, at Isabelle Pk., 9600 ft., Hawk, No. 1, 8260 ft., Hawk, No. 2, 8311 ft., Folding W., 8575 ft., Folding, 9330 ft. and Simpson Overlook W., 8499 ft.

#### SIMPSON PASS

*History and Origin of Name.*—Simpson Pass, situated about eighteen miles by trail, southwesterly from Banff, is at the head waters of Healy Creek on the Alberta side and of a northerly branch of Simpson River on the British Columbia side. The first named stream is a tributary of the Bow River, which it joins about three and a half miles west of Banff. Simpson River flows to Vermilion River, which in turn flows to Kootenay River, a tributary of the Columbia. The pass lies nearly due north and south and its lowest summit is at an altitude of 6914 feet.

The approach up Healy Creek is by a good pony trail, furnishing the most popular route from Banff to Mt. Assiniboine, for which point a branch trail diverges to the southeast about four miles from the summit of the pass. On the western side the grade is much steeper and the trail to Simpson River not nearly in such good condition.

The first recorded crossing of the pass was made by Sir George Simpson, Governor in Chief of the Hudson's Bay Company, in the year 1841 when on a

journey around the world. Travelling up the Bow Valley, he ascended Healy Creek and by one of its many tributaries reached the height of land between the eastern and western waters. On the western side he followed the waters of the Simpson and Vermilion Rivers to the Kootenay Valley. It is presumed

Indian Pk. Sta.



SUMMIT OF SIMPSON PASS  
Looking South

that in doing so he followed an old Indian trail. Owing to the above circumstance the names Simpson Pass and River have been perpetuated. The name appears on Palliser's map, published in 1863. It is said that Sir George Simpson had his name and the date carved on a tree at the summit, but it is also reported that the tree has been cut down and the carving taken away by some vandal.

Simpson Pass W. Sta.



SUMMIT OF SIMPSON PASS  
Looking North

*Topography of the Pass.*—The summit is a beautiful park-like spot and is quite distinct in formation from the two passes previously surveyed. It consists of a shallow, open trough between timbered slopes. An ascent of about 300 feet on its western side discloses an undulating plateau which forms a charming natural park, partly in each province. The area is covered by grass and heather, is dotted with groves of spruce and larch, numerous meadows and small lakes, and is traversed by winding streams, so well mingled that it seems more a work of art than of Nature. The plateau is terminated on the west by a sharply defined rock escarpment of dike-like appearance, extending northwestward from Monarch Mt. and on this side rising abruptly from 400 to 500 feet in height. It has been previously referred to as bounding the valley of Redearth Pass.

On the eastern side of the Simpson summit the rise is more abrupt to a broken piece of terrain slightly above timber line. Here action during the ice age of long ago is clearly shown by the smoothly rounded rocks and the grooving and channelling that separates the various low ridges. Several crater-like depressions, where the broken limestone fragments are twisted and thrown in wild confusion, form catch-basins that drain subterraneously. Southerly, the area ends in an isolated ridge of much shattered formation; enormous blocks of conglomerate rock are heaped one on another in a massive pile. This ridge on the east and the rock escarpment on the west are extremities of the survey of the pass. In both cases the bounding limestone peaks are a considerable distance away; Redearth Pass intervenes on the west and two small, unnamed passes on the east.

Southwestward the dominating feature of the pass is the fine piece of mountain architecture known as Monarch Mountain. It lies in the angle between Verdant Creek and the branch of Simpson River flowing through the pass, its central axis being about two miles from the summit. It rises to an altitude of 9488 feet and presents great precipices and outstanding rock buttresses when seen from the east.

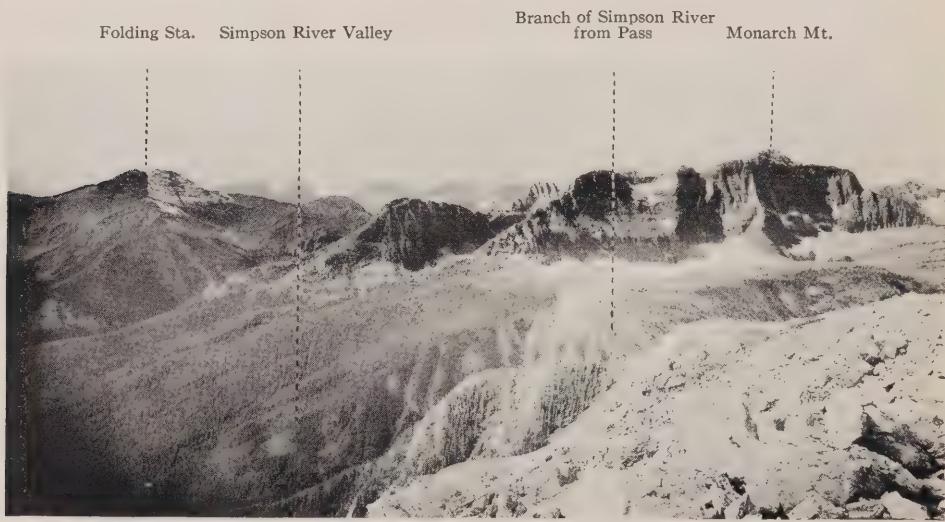
The basin at the head of Healy Creek is deeply indented and heavily timbered. It is enclosed by the hill of Simpson Pass W. Camera Station on the one side and that of Simpson Pass N. Camera Station on the other. Both hills are great piles of shattered rock surrounded by more or less open grassland slopes. From the summit of the pass south the open park lands soon merge in a steep, rock-walled gorge, densely timbered, through which the branch stream flows to join the main Simpson River. The descent is rapid and the trail correspondingly rough.

*Boundary Line.*—Mr. Cautley's party arrived at Simpson Pass on the 19th August. Owing to the indeterminate character of the watershed, the preliminary survey occupied more time than usual.

The pass is designated by the letter "C." In general the watershed is clearly defined on the ground but it is very sinuous, so much so that it was necessary to erect fourteen concrete monuments.

Monument 1C is situated in the grassy meadow forming the centre of the pass. Owing to the fact that one creek which flows in Alberta and another which flows in British Columbia both approach within twenty feet of the watershed line at the summit, it was necessary to build Monument 2 C only 2.86 chains from Monument 1 C in order to avoid cutting off a flowing creek by the establishment of an arbitrary line.

The monuments on the westerly side of the pass are Monuments 2 C, 4 C, 6 C, 8 C, 10 C, 12 C and 14 C, of which Monument 14 C is situated on the summit of the dike-like ridge, referred to as proceeding northwesterly from Monarch Mt., and is the terminal point of the straight line boundary in a westerly direction.



MONARCH MOUNTAIN FROM THE EAST

On the east side of the pass, Monuments 3 C, 5 C, 7 C, 9 C, 11 C and 13 C were built, the last course of the straight line boundary extending from Monument 13 C to Brass Bolt and Cairn 15 C on the isolated rocky ridge referred to.

The total number of concrete monuments built at Simpson Pass was fourteen and the total length of straight line boundary established was 286.63 chains. At the end of the report will be found views of the several concrete monuments erected.

Brass bolts and cairns were established at two points only, viz.: at 15 C and 17 C on the rocky hill forming the eastern terminal of the survey of the pass. These points were occupied with the camera and transit-theodolite; stations were also occupied on the summit of Monarch Mt., and on the hills shown on the map as Simpson Pass W., 8322 ft., and Simpson Pass N., 8080 ft.

*Tie with Land Surveys.*—No established corner of the Land Surveys System was nearer than Bow Valley, some ten miles distant, so it became necessary to connect the line of concrete monuments at the summit of the pass with the northeast corner of Section 24, Township 25, Range 13, west of the Fifth meridian, by means of a triangulation from mountain top to mountain top. This was done jointly by both divisions, and cairns set on the peaks for the purpose were tied in with the monuments by angles read by Mr. Cautley and also by him at a signal placed on the east boundary of Section 25, from which a measurement was made to the corner. The stations used for the above purpose are shown on Sheet No. 13 of the Atlas as Healy Creek E., 9300 ft., Mt. Bourgeau, 9575 ft., Bourgeau N., 8848 ft. and Healy Creek W., 8065 ft.

A Bastion of Citadel Pk.      Summit of Pass



CITADEL PASS—APPROACH FROM SOUTHWEST

For the position and altitude of monuments, bolts and camera stations, as well as for general topography and other information, see Atlas, Sheets Nos. 13 and 13 A. Part of the information shown on Sheet No. 13 is derived from the surveys made by Mr. R. D. McCaw, previously referred to.

At the end of the report will be found descriptions of the locations of the several bolts and views of the cairns over them, also a table of latitudes and departures referring them to the nearest concrete monuments.

Work was concluded here on the 23rd September. Mr. Cautley then went south with his party to Crowsnest Pass and spent the month of October on preliminary work there. A certain amount of preliminary work was also done in a small pass to the north of Crowsnest Pass. The Commissioners

have been unable to come to an agreement as to the proper position of the watershed line in this pass and it has been made the subject of a separate report which will be found in a succeeding chapter. On the 30th October the party was disbanded.

#### SIMPSON PASS TO MT. ASSINIBOINE

Mt. Assiniboine, 11,870 feet in altitude, is situated eighteen miles directly southwest of Banff. It is the central and most prominent peak of the region, the watershed line passes over its summit and it is much visited by mountain climbers and tourists.



ROCK ISLE LAKE  
Looking Southeast

There are two lines of travel to reach the mountain from Banff: the westerly route follows the Bow Valley and Healy Creek to where the trail previously referred to branches from the main trail, about four miles from the Simpson Pass summit, and leads up a tributary valley to the watershed which it crosses several times, finally crossing it at Citadel Pass. The trail then goes southerly to join the Simpson River trail, leading to Mt. Assiniboine. The easterly route follows the Spray River, by road for six miles and then by trail up an eastern tributary of that stream and by the valleys of the Spray Lakes and Bryant Creek, crossing the watershed at Assiniboine Pass and soon after joining the former route. An alternative and shorter route for pony travel, which connects with the trail via the Spray Lakes not far east of Assiniboine Pass, has been opened up Brewster Creek, since the surveys herein described were made.

Citadel Pass is six and a half miles in direct distance southeast of the summit of Simpson Pass and about twelve miles by the line of watershed. Assiniboine Pass is eight and a half miles southwest of Citadel Pass in direct distance and about eleven miles by watershed.

Between the rocky hill on which Monuments 15 C and 17 C are placed and Citadel Pass there lies a stretch of hilly uplands, for the most part open, grassy slopes with scrubby trees and brush on some of the higher ground. Over this stretch the watershed line is very sinuous and the trails from Simpson Pass and Healy Creek cross it a number of times. From 17 C the course is easterly to the crest of a limestone spur extending southwesterly from a group of high peaks on which camera stations, Douglas No. 1 and Douglas No. 2,



LARAX LAKE  
Looking South

are set. The watershed line here turns directly back on the opposite side of a deep gash in the mountain spur and travelling nearly due south ascends the western ridge of Quartz Hill. Directly south of this part of the watershed are Rock Isle Lake and Larax Lake. They drain to Simpson River.

The watershed line now passes over Quartz Hill, 8424 feet, a prominent hill, with a crest of broken blocks of quartz, falling very steeply on the southwest side to form the valley of Simpson River. On the other side the slopes are part of the open tract referred to. From Quartz Hill the general direction of the watershed line is southeast to the summit of Citadel Peak, two and a quarter miles distant. From Citadel Peak it falls northeast, half a mile to the summit of Citadel Pass. Citadel Peak, 8516 ft., is a great block mass, resembling a fortress with outlying bastions. The southwest slopes are very steep and continue those of Quartz Hill. Three small lakes lie close to the watershed on the Alberta side between Quartz Hill and Citadel Peak.

Leaving the pass the watershed line continues the same course to the crest of Fatigue Mt., 9667 ft. in altitude. Simpson River Station, No. XIII of the Railway Belt primary triangulation, is on the summit of the peak. The two summits, Citadel Pk. and Fatigue Mt. are a mile and a quarter apart. They bound the open area on the southeast and the pass lies, a narrow gap, at the foot of their slopes. The approach from Alberta side is very easy and for some distance on the British Columbia side, but the descending slope soon gets steep and the trail is very rough and is littered by windfall. After a course of two and a half miles down this steep valley it joins the Simpson River trail to Mt. Assiniboine.

Mt. Assiniboine



CITADEL PEAK

A high mountain spur, reaching an altitude of 9500 feet, extends from Fatigue Mt. northerly between Douglas and Fatigue Creeks, both of which lie in deep-cut valleys and are tributaries of Brewster Creek. Beyond Brewster Creek is the Bourgeau Range, a very remarkable one owing to the fluted appearance of its peaks on the northwestern face.

Leaving Fatigue Mt., the watershed line doubles back on its previous course and follows a fairly regular southeast direction for two and a half miles to the summit of the peak on the south ridge of which Golden Valley Camera Station is set; thence, it turns nearly east for a mile to the summit of Nasswald Peak, an isolated mass, 9985 ft. in altitude. On this course, at the southern base of Fatigue Mt., there is a minor crossing of the Divide, shown on the map as Fatigue Pass. It separates the head waters of Fatigue Creek from those of the stream flowing from Citadel Pass to Simpson River. It

is something over 7700 feet in altitude and is of no special value as a route for travel.

From Nasswald Pk. the watershed again assumes a southeastern direction for three and three-quarter miles to Og Lake Camera Station, set on a western spur from Brewster Creek W. Station. Midway it passes over a sharp peak of 9300 feet in altitude. From Og Lake Station the course continues two and three-quarter miles to Assiniboine Pass. A third of this distance from Og Lake Station there is another crossing of the Divide from which the water flows on the Alberta side to Bryant Creek and on the British Columbia side to Og Lake. This pass is of no value, all its apparent use being supplied by Assiniboine Pass.

Mt. Assiniboine

Wedgewood Pk.



SUMMIT OF ASSINIBOINE PASS

Assiniboine Pass, as previously stated, is of importance as a main line of travel for the tourist business. It is about 7150 feet in altitude. The approach from the British Columbia side is over rolling land of mixed open and timber. On the Alberta side it is heavily timbered and there is a very steep ascent near the summit.

From the pass southward for two and a half miles the watershed line continues uniformly southeast along the high mountain ridge in the angle between the two most westerly branches of Bryant Creek, to a point close to Marvel Lake Camera Station. From this point, at an altitude of 9300 feet, it turns at right angles and, passing over Wonder Peak, drops to the summit of Wonder Pass, distant one and three quarter-miles. The peak and pass are so called

on account of the wonderful view that meets the eye from their summits: Marvel Lake, Lake Gloria and a huge amphitheatre of glaciers, with a setting of green forest, suddenly appearing. The pass is about 7850 feet altitude at the summit and is of no present value except to reach the lakes and amphitheatre referred to.

The course of the watershed line from Wonder Pass is generally southwest but very erratic, passing over the outlying peaks and ridges of the Assiniboine Group and rising from peak to peak until the highest crest of the great massif is reached at an altitude of 11,870 feet. The distance is about three and a half miles. From the crest of Mt. Assiniboine the watershed line follows the south ridge of this great central group, falling to 9200 feet and rising again to 10,640



THE GREAT EAST AMPHITHEATRE OF THE ASSINIBOINE GROUP

feet in Mt. Aye and 10,860 feet in Mt. Eon. From Mt. Eon it turns north-easterly and, having described a great horseshoe curve, drops to a pass of less than 7000 feet, from which the water drains north to Bryant Creek and south to Mitchell River, a tributary of the Kootenay River.

From Citadel Pass to Assiniboine Pass high mountain spurs project north-erly and northeasterly to form the western escarpment of Brewster Creek Valley. They are separated from each other by the deep-cut valleys of streams tributary to Brewster Creek. The Bourgeau Range swings slightly around the head waters of Brewster Creek and continues its southerly course to form the eastern escarpment of the northerly valley of Bryant Creek.

West of the Divide is of greater interest. Here the valley of Simpson River is a deep trough paralleling the line of watershed. The trail to Mt. Assiniboine, a very rough one much littered by windfall and rock debris,

follows the trough at a distance from the watershed of one to two miles. On the southwest side the valley is lined by bold precipices and glacier-hung heights, on the northeast side by sharp-pointed, grey limestone peaks of the writing-desk type.

The Simpson River apparently heads in three small glaciers directly south of the valley leading from Citadel pass, but the main Simpson Valley, up which the trail leads, continues southeast. It is a wild, desolate spot made still more desolate by the ravages of forest fires.



THE VALLEY OF THE ROCKS

There is here a very remarkable phenomenon: The valley of the trail is undoubtedly the main line of drainage of the ice-fields and glaciers, which are of large size, that fill the hollows of the northeastern face of the Mt. Assiniboine group of peaks and also of Lakes Gog and Magog at its base. Tributary streams flow to these two lakes and to Og Lake, some two and a half miles farther down the valley, but from then on there is no visible waterflow. A very short distance above the junction of the tributary from Citadel Pass and the one from the three glaciers mentioned above, the Simpson River first appears so far as surface flow is concerned. From then until Lake Magog is reached, a distance of eight miles, there is no watercourse in the valley that will in any way account for the natural run-off. It would seem as though at some past geological period immense masses of rock detritus had been carried

or had fallen into the valley, filling it up in places to a considerable height and in others covering the floor and effacing the bed of the stream, which had then assumed an underground flow. The suggestion is borne out by the great litter of rock-fall and rocky mounds and basins that break up the valley floor and make it quite different from the usually symmetrical form of similarly situated valleys.



CURIOS SPLIT ROCK

About a mile from where the stream first appears and a mile and a half south of the watershed, in the midst of the valley, is a charming little meadow; on account of the bright yellow of its grassy stretch, gleaming like gold in the drear surroundings, it was named "Golden Valley" and the camera station directly above it is shown on the map by that name. Near its centre, a large spring by a grove of spruce sent a crystal stream winding along the meadow, very shortly to disappear underground. Beyond Golden Valley, it again became so wildly broken and so littered by great blocks of fallen rock that the name "Valley of the Rocks" seemed appropriate and is so shown on the map

as a landmark. One enormous block of rock, close by the trail, presented a singularly curious appearance. Og Lake marks the widening of the valley, and from then on, grassy slopes and open meadows are met with. Rolling hills, rising to the peaks, enclose it, covered by groves of spruce, balsam and pine, which give place to larch as timber line is approached.

The Assiniboine group of peaks is a very striking one and the central massif, Mt. Assiniboine, rises high above all others in the group. The mountain is of considerable importance, owing to its being visible from a great distance in every direction, and to the fact that the watershed line passes directly over its highest point. Seen from certain view-points it strikingly resembles the



ASSINIBOINE GROUP FROM THE NORTH

Matterhorn of the European Alps, although of considerably less altitude. The group collects very large deposits of snow from which the run-off is drained to north and south by Simpson River and two branches of Mitchell River, all flowing to the Pacific Ocean. On the east the only drainage is by way of Bryant Creek, a tributary of Spray River, which flows to Bow River. Lakes Marvel and Gloria act as reservoirs for this run-off; the former is three and a half miles long by a quarter of a mile wide and the latter three-quarters of a mile long by a little more than a quarter wide; a third and much smaller lake lies between.

Directly north of the group, a low height of land separates Lake Magog, a mile and a half long by half a mile wide and the underground drainage of the Simpson Valley from the drainage of the north branch of Mitchell River. This

divide rises northward to Nub Pk., 9016 ft., on which two camera stations were taken. At the extreme head waters of the north branch of Mitchell River, flowing around the west side of the group, are six other small lakes, all of wonderfully charming appearance. In fact a chain of these beautiful and highly coloured lakes surrounds the group on all sides, doubtless owing to the glacial conditions there found.

To obtain the topography for the section, Simpson Pass to Citadel Pass, the following camera stations were occupied: Monarch Mt. 9488 ft., Douglas No. 1, 9277 ft., Douglas No. 1, 8914 ft., Quartz Hill, 8424 ft. and Fatigue Mt.,

Lake Magog

Low Divide between Sources  
of Simpson and Mitchell Rivers Mt. Assiniboine

LAKE MAGOG AT HEAD OF SIMPSON VALLEY

9667 ft., for the section, Citadel Pass to Mt. Assiniboine, Golden Valley, 9436 ft., Og Lake, 9163 ft., Brewster Creek W., 9400 ft., Gibraltar Rock, 9418 ft., Divide Hill, 9418 ft., Marvel Lake, 9359 ft., Wonder Peak, 9300 ft., Katharine W., 9775 ft., Nub Peak, 9016 ft., and Nub No. 1, 8561 ft.

For positions and altitudes of camera stations, as well as general topography and other information see Atlas sheets Nos. 12 and 13. Part of the information shown is from the survey made by Mr. R. D. McCaw along the Vermilion Valley, previously referred to, and from surveys made by Messrs. W. S. Drewry and J. J. McArthur in the vicinity of the Bow Valley in 1891 and 1892.

The work of the Topographical Division was concluded for the season on October 4.

## CHAPTER IV

### SURVEYS EXECUTED IN 1914

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#### DESCRIPTION OF OPERATIONS

The survey of the boundary was carried on in the same manner as in the previous year: R. W. Cautley, D. and A.L.S., was in charge of the work in the passes and of the erection of concrete monuments, A. O. Wheeler, D. and B.C.L.S., of the survey of the watershed between the passes and of the placing of brass bolts and cairns above timberline and at points where concrete monuments could not be erected.

The location of all courses of the boundary and the positions for monuments were agreed upon by the respective Commissioners in joint conference, J. N. Wallace, D.L.S., acting on behalf of the Dominion Government.

From the 1st June until the 24th August, Mr. Cautley's division was engaged upon the survey in Crowsnest Pass and subsidiary passes, establishing and cutting out the numerous courses defining the boundary and erecting concrete monuments at their intersections.

As stated in the preceding chapter, the month of October, 1913, was spent by this division in making a preliminary survey at Crowsnest Pass, where work was carried over about five miles of the distance but, owing to heavy frosts, no concrete monuments were at that time constructed. A certain amount of preliminary work was also done in a small pass a little more than a mile north of Crowsnest Pass. The Commissioners were here unable to come to an agreement for the proper location of the watershed, on account of certain peculiarities of the topographical formation.

Upon the completion of the survey of Crowsnest Pass proper—the one through which the Canadian Pacific Railway runs—two subsidiary passes, Tent Pass (a) and Ptolemy Pass, were surveyed and monumented. The four passes over the watershed, above referred to, lie in the main Crowsnest Trough and in the conduct of the survey have been grouped together and the survey made continuous.

Mr. Cautley's division then moved southerly, seventeen and a half miles to Flathead Townsite, the first four and a half miles by the Crowsnest to Corbin pack trail through Ptolemy Pass and the remaining thirteen miles

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(a) Shown on sheets 4 and 4 A of the Interprovincial Boundary Map as Tent Mountain Pass. The decision of the Geographic Board changing the name to Tent Pass was not received till after the map had been engraved.

by a good wagon road, recently built by the British Columbia Government, which crosses Flathead Pass, a local summit in British Columbia between waters flowing north and south, and then follows the Flathead River through a heavily wooded country to the International Boundary.

North Kootenay Pass is about four miles northeast of the townsite; it is reached by an indistinct pack trail, branching from the wagon road through the forest, which had to be cut out afresh before it could be used. The survey was completed here on the 10th September.

A move was next made to Akamina Pass, under the mistaken impression that it was South Kootenay Pass, which lies some eight miles farther north. Mr. Cautley reached Akamina Pass by way of the wagon road down the Flathead Valley as far as the mouth of Kishinena Creek, some four miles across the International Boundary, then by a pack trail up Kishinena Creek to the pass, a total distance of approximately sixty-two miles from Flathead Townsite.

Akamina Pass summit was reached on the 19th September and work was carried on until the 30th. From the 1st to the 5th October it rained and snowed continuously, snow falling to a depth of thirty-two inches. The heavy snowfall stopped the work and prevented Mr. Cautley moving out with his party until the 13th October, when he left the pass for the railway at Pincher Station.

Early in June a party of the Topographical division under A. J. Campbell, D. and B.C.L.S., was sent to make a reconnaissance survey by photo-topographic methods of that portion of the watershed at the summit of the pass dividing the waters of Elk River from those of Kananaskis River, where several mineral lots, presumably in British Columbia, were affected by the boundary of the province. The numbers of the lots in question are 8490, 8491, 8492 and 8493. It was found that the original survey of these lots had placed portions of them across the watershed within the Province of Alberta. Four camera and triangulation stations were occupied and sufficient work done to enable a preliminary topographical map to be drawn, showing the actual position of the lots. A full report of the survey was made by Mr. Wheeler to the Commission and a copy of the same forwarded to the British Columbia Government.

At the close of the survey, the party travelled down the Elk River to Crowsnest and joined Mr. Cautley's division in the survey of Crowsnest Pass, Tent Pass and Ptolemy Pass, completing the work in that vicinity on the 20th August.

The survey of the watershed was next carried from Ptolemy Pass to North Kootenay Pass and completed at the latter on the 4th September.

From North Kootenay Pass the division worked southward along the watershed to Middle Kootenay Pass and covered all the necessary ground that could be reached from it. A move was then made across the pass and,

travelling down the west branch of Castle River and up the east branch of the same stream, the north fork of Blakiston Brook was reached near its head. The valley of this stream was now followed to a wagon road leading to Akamina Pass, where Mr. Cautley's division was at work.

Mr. Wheeler started on September 21st by this route and joined Mr. Cautley's camp at Akamina Pass on the 24th. The distance is about seventy-five miles, considerably longer and more difficult than by way of the wagon road down Flathead Valley, the route travelled by Mr. Cautley.

Mr. J. N. Wallace, the Dominion Government Commissioner, had arrived several days before and together the Commissioners went over the ground and jointly decided upon the courses and positions of monuments necessary to establish the boundary across Akamina Pass. Early in October the heavy snow-storm, referred to above, prevented further operations.

Meanwhile, the Topographical division had been caught in the snow-storm at the head of Blakiston Brook and was only able to move down it to the wagon road. On the 7th October they were joined here by Mr. Wheeler and on the 8th the division started for the railway at Pincher Station, arriving there on the 10th.

#### CONCRETE MONUMENTS

At the recommendation of your Commissioners, Mr. Cautley was authorized to procure heavy brass plates for the concrete monuments erected in 1914, in substitution for the lighter variety used the previous year. The fifty-nine monuments built in 1914 may be taken as having averaged 2000 lbs. of material each, or fifty-nine tons in all, which had to be packed an average distance of perhaps five miles and 1000 feet in altitude.

#### CROWSNEST SYSTEM OF PASSES

The cretaceous or coal-bearing area of the Elk River Trough, at the south end of which lies Crowsnest Pass, is bounded on the west by a high limestone range forming the western side of the Elk River Valley; on the east it is bounded by the limestone peaks of the Elk Mountains, the High Rock Range and the Flathead Range, and on the south by the Macdonald Range. Gradually getting narrower, it extends northward between these ranges to the head waters of Kananakis River.

A gap between the High Rock and Flathead Ranges and the approaches to it from east and west form the Crowsnest Pass over the continental divide. The watershed line, which lies along the crests of the High Rock Range, at the summit of the pass dips in a bow for a short distance westward into this coal-bearing area and then ascends to the crests of the Flathead Range, which is here the eastern escarpment of the Rocky Mountains. The distance from where it leaves the limestone of the High Rock Range to where it ascends that of the Flathead Range is approximately thirteen and a half miles.

Within this distance, there are four travelled crossings of the watershed, viz: the main or Crowsnest Pass, through which the Canadian Pacific Railway runs, a narrow pass a mile and a half north of the main pass and two others south of it. That to the north is immediately below Mt. Phillipps (b) and your Commissioners suggest that it be named Phillipps Pass. The first one south of the main pass is directly below Tent Mountain and is shown on the maps of the survey as Tent Pass; the second, at the foot of the west slopes of Mt. Ptolemy, is shown on the maps as Ptolemy Pass.

On the eastern side of the watershed the main crossing and the two southern ones have a common approach through the gap between the High Rock and Flathead Ranges; on the western side the two southern crossings are approached by the valley of Michel Creek and the two northern by the valley through which the railway runs.

In all the passes heretofore surveyed by the Commission, it has been the practice to carry the delimitation of the watershed from the summit of the dominating limestone peak on one side to the summit of that on the other side. It was decided to do the same in this case and, consequently, the four passes referred to are included in one continuous survey. The topographical features and other characteristics are described below under their respective names.

#### PHILLIPPS PASS

*History and Origin of Name.*—The gap between the High Rock and Flathead Ranges, forming the main Crowsnest Pass, is a narrow one, for the most part filled by Crowsnest Lake; so much so that it has been necessary to blast out a road-bed for the passage of the railway. On this account a road for vehicles has been constructed through Phillipps Pass. Travelling westward, it joins the road from Crowsnest Station to Michel about two miles west of the summit of the pass and it is then necessary to travel back along the said road more than a mile to reach the station. The grade is much steeper and the route more circuitous than would be the case if the road lay directly through the gap, where a road for vehicles is now being constructed.

The mountain peak dominating the pass on the north side is known locally as Mt. Wilson but, owing to there being another Mt. Wilson with prior rights to the name, this one has recently been changed to Mt. Phillipps, by order of the Geographic Board of Canada. It would seem to be a suitable name for the Pass and your Commissioners so recommend.

*Topography and Characteristics.*—The pass is a narrow gap between Mt. Phillipps and Crowsnest Ridge, by which latter it is separated from Crowsnest Pass. The slopes on both sides are very steep and on the south are timbered to the crest of the ridge.

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(b) Shown on Sheets 4 and 4 A as Mt. Tecumseh. See note (a) on page 57.

At the summit of the pass the width is not more than a quarter of a mile, and here is found a very peculiar topographical formation: a small pond, some nine acres of surface area, lies in a basin of which the enclosing perimeter forms the summits of the approaches to the pass from either side, about a mile apart and of very nearly the same altitude, the eastern being 1.7 feet higher than the western, and the pond about seventy feet below the elevation of the summits. The only apparent drainage to the basin is the natural precipitation that falls within it and there is no visible surface outflow.

The complication that arises is due to the following circumstances: on the northern shore of Crowsnest Lake, about three-quarters of a mile from its western extremity, a swift stream, fed by a subterranean drainage, issues from a cave in the rock slopes beside the railway and discharges almost immediately

West Approach      Pond at Summit



SUMMIT OF PHILLIPS PASS

into the lake. On the 27th October, 1913, Mr. Cautley estimated that the discharge was equal to about 1000 miner's inches. The distance between the cave and the pond is slightly greater than a mile, in a northwest direction, and the cave is about 650 feet below the elevation of the pond. It was held by the Dominion and Alberta Commissioners that subterranean drainage from the pond flowed to this stream and so to Crowsnest Lake, which lies on the Alberta side of the watershed. It was assumed by them that there was sub-surface drainage because the sides of the basin showed a high-water mark from six to eight feet above the surface level of the pond at the time of the survey. On the other hand, the British Columbia Commissioner held that the matter of sub-surface drainage was theoretical, that the watershed could only be determined by actual surface indications and that the eastern summit was its true position. It was found impossible to arrive at an agreement and, at the request of the Alberta Government, the matter was set on one side for arbitration.

The road for vehicles referred to above as traversing the pass is the motor road connecting the prairies of Alberta with the coal-mining centres in the Michel and Elk River Valleys.

#### CROWSNEST PASS

*History and Origin of Name.*—Crowsnest Pass is shown on the general map of the Palliser Expedition, published in 1863. Capt. T. Blakiston, R.A., geographer to the expedition, 1858, refers to it in his report, on hearsay from the Indians, as "a very bad road and seldom used," and it was not surveyed or travelled over by any of Palliser's parties. It is the route followed by the Crowsnest line of the Canadian Pacific Railway, which branches from the transcontinental line at Pasqua, near Moosejaw, and has its terminus at Kootenay Landing on Kootenay Lake. It also connects the coal-fields on the

Crowsnest Mt.

Crowsnest Lake



CROWSNEST LAKE AND PASS

Gap at East Entrance

Alberta side with those on the British Columbia side of the watershed. These coal-fields are of very great value; the supply is immense and the quality, a soft bituminous coal, well suited for the manufacture of coke.

Crowsnest Mountain, seen from the south, stands out an isolated massif, rising in terraces and resembling a great fortress or keep; it is about seven miles northeast of the summit of the pass and heavy green forest surrounds it on all sides. There is no certainty how the pass derived its name. A Palliser Expedition Map, 1859, shows "Crow" river and at its head "Lodge des Corbeaux." A Palliser Expedition map, 1860, shows "Crow Nest" river and "Crow Nest" pass. Palliser's full map "to accompany 'The Journals, Detailed Reports and Observations' presented to both Houses of Parliament by command of Her Majesty, 19th May, 1863" shows "Crow Nest Pass" (reported by Capt. Blakiston) and "Crow Nest R." The last mentioned map also shows "The Crow's Nest," a name applied to the mountain rising seven miles northeast of the pass summit.

There is a legend that a party of Crow Indians were attacked by their enemies from the plains and, retreating to the mountain, were there besieged and killed. White's "Place-Names in the Rocky Mountains" has the following: "Crowsnest; mountain, Alta.; translation of Cree Indian name, *Kah-Ka-oo-wut-tshis-tun*; does not commemorate the slaughter of Crow Indians by the Blackfeet when they got them in a corner or 'nest,' as set forth in local tradition, but merely the nesting of crows near the base of the peak. Name first appeared on the Palliser Expedition map. In a map accompanying Palliser's preliminary report, it is named "*Lodge des Corbeaux*."

*Topography and Characteristics.*—The defile of Crowsnest Pass, on the Alberta side of the watershed, has a general east and west direction; on the British Columbia side it bears northwest. The altitude of its lowest summit is 4453 feet above sea-level. Three lakes of considerable size are found in the

Crowsnest Ridge Island Lake Crowsnest Lake Sentry Mt.



ISLAND LAKE AND CROWSNEST PASS SUMMIT  
Looking East

defile near the summit of the pass, viz: Crowsnest Lake and Island Lake, on the Alberta side, and Summit Lake on the British Columbia side. Crowsnest Lake, the most easterly one, is approximately four and a quarter miles long with an average width of a quarter of a mile; Island Lake is nearly a mile long by half a mile wide and Summit Lake is less than three-quarters of a mile long by an eighth of a mile wide. The two latter are situated each about a quarter of a mile from the watershed on opposite sides of the summit of the pass.

Island Lake receives the waters of Island Creek, a small stream flowing from the south, and discharges into Crowsnest Lake. Crowsnest Lake is fed by the west branch of Crowsnest Creek, flowing from Tent Pass, and by the east branch of the same stream, flowing from Ptolemy Pass. The two branches unite three and a half miles above the lake, and a mile below the junction the main stream is joined by Ptolemy Creek. The lake also receives the discharge of the subterranean stream referred to as issuing from a cave beside its north shore.

Crowsnest Lake discharges by way of Crowsnest River to Oldman River which, in turn, joins the South Saskatchewan, and this large stream, having united with the North Saskatchewan, finds its way to Lake Winnipeg, which empties by Nelson River through Hudson Bay into the Arctic Ocean.

From Summit Lake, on the west side of the watershed, a small stream flows to Alexander Creek. The latter is a tributary of Michel Creek flowing to Elk River, which discharges into Kootenay River. Kootenay River, having followed a very circuitous course, joins the Columbia which, with a total run of 1100 miles, discharges into the Pacific Ocean near Portland, Oregon.

Crowsnest Pass is bounded on the north by Crowsnest Ridge and the southern slopes of Mt. Phillipps. The ridge, altitude 6198 feet, is of a limestone formation similar to Mt. Phillipps from which it is separated by the narrow defile of Phillipps Pass. On the south, the pass is bounded by the northern slopes of Sentry Mt., Island Ridge and Loop Ridge. On each side of Crowsnest Lake the mountain slopes are precipitous and form the narrow gap giving entry to the Crowsnest divide; westward, the pass opens out and more gentle slopes become apparent.

North of the railway, most of the timber has been destroyed by fire, but south of it are seen wide stretches of green timber, reaching to the summits of the lower hills, chiefly pine (*Pinus Murrayana*) and spruce, mixed with balsam, and larch at the higher elevations.

Crowsnest is a divisional point of the Canadian Pacific Railway. It has a railway station, hotel, post office and store, the other dwellings being for the most part residences of employees of the railway company. Its principal importance is in connection with the coal industries that are being carried on both east and west of it. A few tourists come to the hotel during the summer months to enjoy the mountain surroundings and to fish for trout in Crowsnest Lake and the adjacent streams.

*Boundary Line.*—Crowsnest system of passes is designated by the letter F. Concrete Monument "F" was erected on the watershed line where it intersects the summit of the pass close by an old wooden post, set there to mark such intersection by the late John McLatchie, B.C.L.S., from which he ran a meridian line south to the International Boundary.

North of the Monument F, the watershed line is sinuous and ascends the open, broken, rocky slopes of Crowsnest Ridge in a general northeast direction to its crest, which forms the line of demarcation between Crowsnest Pass and Phillipps Pass. Monuments 2 F, 4 F, 6 F, 8 F, 10 F, 12 F and 14 F were here built by Mr. Cautley's division. Monument 16 F would have been a concrete monument on the crest of the ridge, at an altitude of 5520 feet, but it was not placed pending a settlement of the disagreement concerning the location of the watershed across Phillipps Pass.

At the summit of Crowsnest Pass, the watershed line leaves the limestone formation and trends in a southwesterly direction through the village to

Monument 3 F, the hotel, post office and store being on the British Columbia side. It then rises abruptly to Monument 5 F, altitude 4749 feet, at the apex of a ridge, from which point the direction is northwest through green timber to Monument 9 F. Here, it turns southwest again on a very sinuous course, chiefly through brûlé and windfall, to Monument 19 F, from which it rises steadily in the same general direction to Monument 39 F at the highest point of Loop ridge, altitude 6674 feet above sea-level. From 19 F to near the top of the ridge the watershed line is in green timber, but several patches of open grass-land are met with; at the top of the ridge brûlé is again seen and the crest is broken and rocky. Leaving 39 F, it follows the ridge to 59 F, in a general direction a little east of south, over a number of round-topped eminences, separated by shallow dips and varying in altitude from 6000 to

Loo p Ridge



BOUNDARY LINE OVER LOOP RIDGE—MONUMENT 29 F

6500 feet; some show open grass-land, others patches of brûlé; and outcrops of rock and coal are seen. From 59 F the watershed line descends south-easterly through heavy brûlé and windfall to 65 F, where it turns nearly east to 69 F, crossing, shortly before that station is reached, the government wagon road from Crowsnest Station to the mining village of Corbin on Michel Creek. The course from 69 F to 73 F is southwest and the summit of Tent Pass lies between the Monuments 71 F and 73 F. All the monuments above referred to are of the concrete type and were erected by Mr. Cautley's division.

The slopes of Loop Ridge, on its eastern side, are, for the most part, covered by green timber, but there are a few open spaces and some patches of brûlé and windfall; numerous small watercourses drain to Island Creek and to the west branch of Crowsnest Creek. On the western side, the slopes are steeper and rocky ridges separate the water courses flowing to Michel Creek.

The Eastern British Columbia Railway follows the valley of Michel Creek, along the western base of Loop Ridge, from McGillivray Station at the southern extremity of the loop described by the Canadian Pacific Railway up the valley of Michel Creek, to overcome the steep descent on the western side of Crowsnest Pass. Its general direction is south and southeast and its distance from the watershed varies from one and a quarter to two miles.

#### TENT PASS

*History and Origin of Name.*—Tent Pass is only remarkable because the government road from the Canadian Pacific Railway to the International Boundary traverses it. Over the Crowsnest-Corbin section the road-bed has been fairly well built, but it appears to have been located along some former pack-trail with a fine disregard for the engineering possibilities of

Tent Mt. Ridge



MONUMENT 57 F ON OPEN GRASSY CREST OF LOOP RIDGE

maintaining an even grade, so that its value for teaming purposes is largely discounted by some very sharp and entirely unnecessary grades.

The name is suggested by the Commission owing to the pass being dominated on the south side by Tent Mountain.

*Topography and Characteristics.*—The direction of the pass is northeast and southwest. The summit is a narrow gap between the steep slopes of Loop Ridge on the northwest and Tent Mountain on the southeast. The Alberta approach is gradual, the British Columbia one much steeper. The lowest summit of the pass is occupied by a narrow marsh with benches on either side, covered by heavy standing and fallen dry timber, and is 4902 feet in altitude, only 450 feet higher than Crowsnest Pass, from which it is distant four and a quarter miles in a southwesterly direction. Practically all the timber on the north slopes of Tent Mountain Ridge has been killed by fire. On the northwest side of the summit there are two small ponds at the head of the west branch of Crowsnest Creek. Several moose were seen in this vicinity.

The top of Tent Mountain Ridge is fairly open, with scattered small patches of brûlé; coal and rock outcrop frequently. The northeast slopes descend steeply to Ptolemy Pass and are, for the most part, covered by brûlé and windfall. Coal prospectors have tunnelled into the hillside on the north slopes of the mountain. On the southwest side the slopes fall steeply to Michel Creek, along which runs the Eastern British Columbia Railway; most of the timber on them has been burned and only a sprinkling of green pine and spruce is seen.

*Boundary Line.*—From Monument 73 F, altitude 4936 feet, to Brass Bolt 81 F, altitude 6862 feet, the watershed lies southeast up the steep slopes of Tent Mountain. Concrete Monument 79 F was the last that could be here erected, owing to the difficulties of transporting material, and, although the line was cut out through the timber to 81 F, from that point to 89 F brass bolts were placed on the higher elevations of the ridge to mark the line of the



TENT PASS  
Looking Southerly

watershed which, between the points named, is naturally defined. The bolts so placed were fixed in position by Mr. Cautley, who extended his survey along the top of the mountain in order to carry it to Ptolemy Pass.

Bolt 83 F, altitude 7174 feet, is on the top of a rock bluff at the most northerly extremity of the crest of Tent Mountain. The summit ridge is a mile long and is marked by several eminences of little difference in elevation, the centre and highest one, on which Bolt 85 F was placed, having an altitude of 7209 feet.

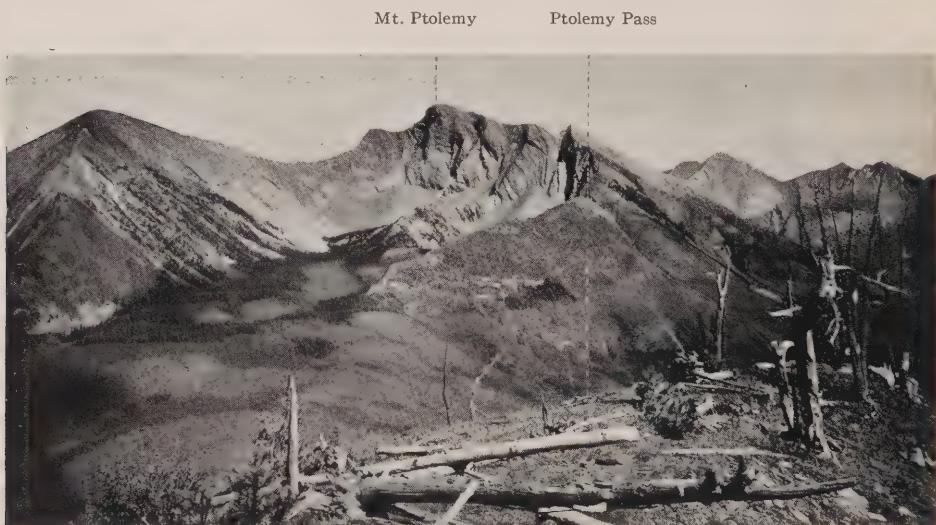
From the bolt at 89 F to monument at 91 F the course is northeast and the watershed descends through a dense array of standing, fire-killed timber, which continues in nearly the same direction to Monument 93 F, erected at the lowest summit of Ptolemy Pass.

## PTOLEMY PASS

*History and Origin of Name.*—Ptolemy Pass is distant from Crowsnest Pass a little more than five miles in a nearly south direction. A pack trail leaves the government road about two and a quarter miles from Crowsnest

Station and, following the valley of the east branch of Crowsnest Creek, leads over the pass and down a tributary of Andygood Creek. It follows the valley of the latter stream to a junction with the same road beyond Tent Pass, and so up the Michel Valley to Corbin. The distance from Crowsnest to Corbin by way of the trail is about eleven miles, and it would be possible to build a good road for vehicles through the pass without encountering any serious difficulty in securing reasonable grades.

The name is due to the mountain which dominates the pass on the east side. Seen from the west, the summit ridge bears a very striking resemblance to a recumbent Pharaoh (see illustration) and it has for many years been



Mt. Ptolemy and Ptolemy Pass

spoken of as Mummy Mountain. The name "Mummy" is not suitable for the pass and there are Pharaoh Peaks elsewhere, so the Commissioners have suggested the name "Mt. Ptolemy" and have applied it to the pass.

*Topography and Characteristics.*—The altitude of Monument 93 F, situated at the lowest summit of the pass, is 5615 feet above sea-level. From it, the general course of the watershed lies southeast, rising steadily over easy slopes covered by brûlé and windfall to an altitude of 6229 feet at Monument 100 F. Here the watershed line crosses a narrow defile and rises swiftly to Monument 101 F, altitude 6574 feet, where a brass bolt with rock cairn over it has been placed. Monument 101 F is on the north extremity of the western ridge of Mt. Ptolemy and from this point the watershed may be said to commence the ascent of the limestone portion of the Flathead Range. The ridge is sharply defined as a natural boundary and the watershed describes a semicircular curve along its

edge to the summit of the mountain. Brass bolts and cairns, 103 F, 105 F and 107 F were placed at commanding summits of the ridge, 107 F being set on the highest point of Mt. Ptolemy, which holds the distinction of being the highest peak of the Flathead Range, with an altitude of 9234 feet. Northward of the ridge lies a deep, shale-filled amphitheatre enclosed by precipitous rock walls, from which the drainage flows to the east branch of Crowsnest Creek; on the south side, steep, broken and rocky slopes fall to Andygood Creek.

*Boundary Line.*—In the Crowsnest system of passes, Mr. Cautley completed the preliminary survey commenced by him in 1913, including nine miles of trial lines and a good deal of levelling at certain places, after which thirteen miles of final survey was made, involving the building of fifty-four concrete

Mt. Ptolemy

Ptolemy Pass



PTOLEMY PASS  
Looking Southeast

monuments. Nine brass bolts with rock cairns over them were established. The boundary has been surveyed as a series of straight lines from Monument 14 F, northeast of Crowsnest Pass, to Bolt 81 F on the northerly extremity of the crest of Tent Mountain, a distance of 9.8 miles. From Bolt 81 F to Bolt 89 F, the boundary follows the summit of Tent Mountain Ridge to a point opposite Ptolemy Pass, a distance of approximately 1.3 miles. From Bolt 89 F the boundary has been surveyed as a series of straight lines across Ptolemy Pass to Bolt 101 F, which is situated on the east side of the said pass, on the westerly slopes of Mt. Ptolemy, and comprises 1.85 miles. Appended to the report will be found descriptions of the brass bolts and cairns and views of the monuments established, also a table of latitudes and departures referring the brass bolts to the nearest concrete monuments.

Twenty-two camera stations were occupied by the Topographical division to obtain data to map the Crowsnest system of passes; they are as follows,

commencing at the north end: Mt. Phillipps No. 1, 8204 ft., No. 2, 8036 ft., Mt. Erickson, 8138 ft., Crowsnest Ridge No. 1, 5948 ft., No. 2, 6196 ft., No. 3, 5520 ft., Island Ridge No. 1, 5869 ft., No. 2, 5970 ft., Trail Hill No. 1, 5804 ft., No. 2, 5769 ft., Ptolemy Shoulder, 6878 ft., Ptolemy North, 8259 ft., and, along the watershed, at 29 F, 39 F, 53 F, 57 F, 61 F, 83 F, 87 F, 89 F, 103 F and 107 F at the summit of Mt. Ptolemy.

For position and altitude of monuments, bolts and their cairns and camera stations, as well as for general topography and other information see Atlas, map sheets, Nos. 4 and 4 A.

*Tie with Land Surveys.*—The Crowsnest district has been subdivided into sections by the Dominion Government on the Alberta side of the boundary, so that no trouble was experienced in making a direct connection with previously surveyed lines. These connections involved resurveying the said lines as far as the nearest iron post marking a section corner, and square wooden posts, marked respectively "Alta." and "B.C." were placed at the intersections with the boundary. Two and a half miles of line were run for such purpose.

On the British Columbia side connection was made with the previously surveyed lines of mining locations 7215, 8276 and 8277. As these locations abut on the Interprovincial Boundary and the original surveyors had, therefore, been obliged to make a provisional survey of the boundary itself, it will be necessary to rectify the northerly boundaries of the locations to make them conform to the Interprovincial Boundary as established by the Commission. The matter is fully dealt with in a report by Mr. Cautley to the Commission, dated the 11th February, 1915, accompanied by a plan.

Connection was, also, made by Mr. Cautley with the meridian base line run by John McLatchie, B.C.L.S., from a point at the Crowsnest Pass summit to the International Boundary, at a post marked "V Miles, 61.85 chs." on the southeast side of Tent Mountain Ridge.

#### GENERAL REMARKS ON THE BOUNDARY THROUGH THE CROWSNEST SYSTEM OF PASSES

As previously stated, the watershed line leaves the limestone formation at the summit of Crowsnest Pass and extends in an irregular curve westerly into the cretaceous coal-bearing area for a maximum distance of about two and a half miles, returning to the limestone after having crossed Ptolemy Pass. The cretaceous area consists of a series of parallel ridges trending northwest and southeast, separated by wide valleys with good sized streams flowing in them and by valleys at right angles to the general trend, carved out by lateral streams. They are generally covered on the north and east slopes by wide stretches of green timber and tracts of brûlé and windfall, but present many open grassy spaces on the south and west slopes and along the crests of the ridges. All this section of country is underlain by valuable coal deposits, which outcrop on many of the ridges, and old prospect holes are seen right on

the watershed. The same conditions are found on the Alberta side of the watershed, extending easterly throughout the foothills area of that region. So much coal has been discovered in this district and the market for it is, at present, so limited that many owners have to be content with doing development work only; but, that the district will one day be a hive of industry, giving employment to many thousands of men, no one can doubt.

Goats, moose, deer, bears, a great number of blue and ruffed grouse and ptarmigan on the rock slopes above timber-line, were seen on this part of the work; in fact, Mr. Cautley experienced some difficulty at one part of the line, where two bears would tumble sacks of cement into holes dug for monument bases, scatter gravel about and, on one occasion, dragged a full sack of cement more than a quarter of a mile through the woods.

Mt. Darrah



Mt. DARAH  
Looking Southeast

#### PTOLEMY PASS TO NORTH KOOTENAY PASS

From the summit of Mt. Ptolemy, the watershed line follows its eastern ridge and over two adjoining crests for a distance of six miles in a northeast direction. It then turns southeasterly and ascending to the western corner of Mt. Coulthard, 8600 feet, swings south and southwest four and a half miles to the summit of Mt. Pengelly, 8512 feet. This section of the watershed encloses the amphitheatre forming the catchment basin of Andygood Creek, which enters Michel Creek near the village of Corbin. On the Alberta side the headwaters of Ptolemy and York Creeks, tributaries of Crowsnest River, and of Link Creek, a tributary of Carbondale River, flow from it.

Leaving Mt. Pengelly, the divide line continues nearly south for two and a quarter miles over two intermediate summits, both exceeding 8000 feet, to the highest point of Mt. Darrah (c) at 9038 feet above sea-level. From

(c) Shown on Sheet 3 as Gable Mt. See note (a) on page 57.

Mt. Darrah it continues, twisting in the same general direction, for about three miles, when it turns more to the east. On the west side an amphitheatre of Mt. Darrah drains by a tributary of Michel Creek flowing past the village of Corbin; on the east the water flows to Link and Lost Creeks, both tributaries of Carbondale River.

From the last mentioned point the watershed now travels a little east of south to Monument 2 G, directly above the summit of North Kootenay Pass, on the way climbing several peaks of which the highest reaches an altitude of 8500 feet. On the east the water drains to Lost Creek and on the west to Squaw Creek, a tributary of Flathead River.

Mt. Darrah

Corbin Coal Mines

Michel River Valley



THE CORBIN COAL MINES  
Looking Southerly

The mining village of Corbin is the terminus of the Eastern British Columbia Railway. It has a good hotel, a post office and several stores and, when the mines are working full time, a couple of hundred men are employed. The mines are situated on a low mountain of 6800 feet altitude, directly south of the village. The highest shaft is at an altitude of 6200 feet and the railway is carried to it by a series of steep zig-zags, so that coal is loaded on the trucks directly at the mouth of the shaft.

The government road from Crowsnest to the International Boundary passes half a mile west of the village and proceeds up the valley of Michel Creek, crossing Flathead Pass, about two miles west of the watershed, at an altitude of 5700 feet. It then descends along the valley of Squaw Creek, a tributary of Flathead River, to Flathead Townsite, thirteen miles from Corbin by the road.

Flathead Townsite—so called—is a level little prairie, interspersed with belts of pine, poplar and spruce, and surrounded by high mountains. It is

situated directly opposite North Kootenay Pass, about four miles to the southwest. At some past date, during a mining boom, a townsite was laid out, but now it is only occupied by a mining development company and a few prospectors.

Close to the townsite a pack-trail branches from the government road and leads up the valley of a stream, tributary to Flathead River, to the pass. The grade is easy until within the last mile, when a very steep ascent of about 1200 feet occurs, which is overcome by a series of switch-backs. The trail is a rough one and through disuse had, at the time of the survey, become much overgrown and had to be cut out in many places before it could be travelled.

Pack Trail      Kootenay Pass N. Station



NORTH KOOTENAY PASS  
North Summit

On the east side of the watershed, a wagon road from the railway near Blairmore, which is joined by a pack-trail from Coleman, leads up York Creek to near its source. From this road a pack-trail crosses the divide between York and Link Creeks and follows the valley of the latter stream to a wagon road leading up Carbondale River. Four and a half miles west of the junction, the road becomes a pack trail which continues up the valley six miles farther to North Kootenay Pass. It will thus be seen that there are continuous lines of travel, varying in quality, from the Canadian Pacific Railway south along both the eastern and western bases of the Flathead Range.

In the vicinity of Corbin much valuable timber has been burned by forest fires, but in the valley of Michel Creek and extending for a mile or so over the Flathead Pass in the valley of Squaw Creek is a fine body of large-sized

green timber valuable for commercial purposes. Well-timbered areas are also found in the vicinity of Mt. Darrah, in the Flathead Valley, and for a considerable distance up the valley of the stream from North Kootenay Pass. Much of this timber has a commercial value. All the valleys of the streams flowing from the watershed on the Alberta side are well-timbered near their heads and doubtless will, in the future, furnish important supplies for mining and commercial purposes.

Mountain goats are seen on the peaks of the Flathead Range and ptarmigan on the rocky slopes above timber-line. Small deer, bears and several kinds of grouse frequent the timbered areas at lower levels.

In order to map the section of the watershed above described and its vicinity, sixteen triangulation and camera stations were occupied by the Topographical division, viz.: Mt. Pengelly, 8512 ft., Mt. Darrah, 9038 ft., Corbin East, 7901 ft., Michel Head, 7663 ft., Darrah West (d) 7602 ft., Flathead Pass, 5790 ft., Flathead Pass No. 1, 7435 ft., Flathead Pass No. 2, 7596 ft., Saddle East, 7442 ft., Sawdoff East, 7320 ft., Sawdoff West, 7577 ft., Mt. Errigal (e) 8542 ft., Mt. Errigal West, (f) 7968 ft., Squaw Creek West, 7772 ft., Squaw Creek East, 8021 ft. and Kootenay North, 7930 feet. For positions and altitudes of camera stations, as well as general topography and other information, see Atlas, map sheets, Nos. 3 and 4.

#### NORTH KOOTENAY PASS

*History and Origin of Name.*—The "Kootanie" Indians inhabited, and still inhabit, the area enclosed by the southern bend of the Kootenay River. The Tobacco Plains, where there are considerable tracts of bunch-grass prairie, occupy the eastern portion of the bend and extend across the river. It is here the Indians have their home and raise the fine breed of native horses for which they are said to be famous. When the buffalo were found in great herds on the plains of Alberta, it was the custom of these Indians, each summer, to cross the mountains by way of North Kootenay Pass, which lies in a direct line of travel, and secure a supply of meat for the following winter. On Palliser's map, 1863, the crossing is shown as "Kootanie Pass" and was explored by Capt. T. Blakiston, R.A., of the Palliser Expedition in 1858. It is, however, likely that it was known by that name to the Hudson's Bay Company's traders long before his arrival and had reference to its being the main line of travel for the "Kootanie" Indians.

In his report, Capt. Blakiston states that the Kootanie Indians told him of a more southern pass which came out on the east side, near Chief's Mountain, situated at the edge of the Prairies, close to the International Boundary;

(d) Shown on Sheet 3 as Gable West.

(e) Shown on Sheets 3 and 3 A as Mt. Centre.

(f) Shown on Sheet 3 as Centre W. See note (a) on page 57.

also that there were long hills but not so steep as the Kootanie Pass. He returned by this route, which is shown on Palliser's map as Boundary Pass. The two passes are now known, respectively, as North Kootenay Pass and South Kootenay Pass.

*Topography and Characteristics.*—The North Kootenay Pass crosses the divide in a northeast and southwest direction. In direct distance it is twelve and a half miles southeast of Ptolemy Pass but, following the line of watershed, is approximately twenty-five miles distant. Eastward, water flows from the pass by a branch of Castle River, which is crossed by the railway between Pincher and Cowley Stations and flows into Oldman River, then by way of the Saskatchewan, Lake Winnipeg and Nelson River to Hudson Bay. West-

Flathead Townsite

Flathead River Valley



FLATHEAD RIVER VALLEY  
Showing Flathead Townsite

ward, the flow is to Flathead River, which joins the Columbia and so finds its way to the Pacific Ocean.

North Kootenay Pass is in reality a twin pass at its summit, that is to say: it consists of two narrow defiles walled in by rock-slides, about half a mile apart and separated by a steep, bare hill rising 600 feet above them. The altitude of the northern summit is 6774 feet and of the southern one, 6749 feet above sea-level. On each side of the pass bare mountains rise abruptly.

The approach on the British Columbia side is very steep and the construction of a road would be arduous. On the Alberta side the approach is easier and a road could be more readily made. Owing to the fact that the approaches of the pass are so steep, particularly from the British Columbia side, it is not of very great importance as a possible route for travel and the manager of the mining development company informed Mr. Cautley that

only three or four people had come over the pack-trail during his three years' residence there.

Both summits are devoid of timber, although scrubby pines and dead trees, killed by fire, are found at a greater altitude. At a lower level, the valleys on both sides are well timbered but, until a comparatively low level is reached, the timber is of little commercial value.

From the North Kootenay Pass it becomes apparent that the eastern slopes and foothills do not cover a very great extent of country in an easterly direction and the prairies in the vicinity of Pincher Creek are clearly visible from the hill between the two summits of the pass.

*Boundary Line.*—The pass is designated by the letter G. Five concrete monuments and four brass bolts with cairns over them were erected to mark the boundary, the outlying bolts and cairns being placed on the crests of dominating limestone peaks or ridges above the pass.

Monument 1 G is at the lowest summit of the northern crossing. Monuments 3 G, 5 G and 7 G are on the intervening hill and Monument 9 G is at the lowest summit of the southern crossing. North of the gap, Bolts 2 G and 4 G were placed, the latter on the highest point of the nearest dominating peak at an altitude of 8181 feet; on the south side were placed Bolts 11 G and 13 G, the last on the crest of the dominating ridge, at 7906 feet above sea-level.

On either side of the two summits of the pass, bare mountains rise so steeply that a chain survey could not be carried beyond them; moreover, they were so situated that it was found impossible to make a direct survey to connect the monuments erected on the respective summits of the pass with those on the central hill and, in consequence, an outside station had to be established and the positions of the intermediate monuments determined by triangulation from it as one extremity of a measured base line.

Camera stations were occupied by the Topographical division at Bolts 4 G, 8181 ft., 11 G, 7775 ft., and 13 G, 7906 ft.

At the end of the report will be found views of the concrete monuments and cairns over brass bolts that have been erected, descriptions also, of the positions of the brass bolts placed and a table of latitudes and departures referring them to the nearest concrete monument. For the positions and altitudes of monuments and bolts, as well as for general topography and other information, see Atlas, map sheets, Nos. 3 and 3A.

*Tie with Land Surveys.*—Connection was made, on the east side of the watershed, between the boundary as established in North Kootenay Pass and the northeast corner of Section 24, Township 5, Range 5, west of the Fifth meridian by means of triangulation, the distance being about two miles. On the west side, in the Flathead Valley, a tie was made by the Topographical division at mile-post, No. 18, of the meridian run south by John McLatchie from Crowsnest Station to the International Boundary.

## NORTH KOOTENAY PASS TO MIDDLE KOOTENAY PASS

From North Kootenay Pass to Middle Kootenay Pass the watershed line extends in a general southeast direction, describing a series of irregular loops, back and forth, from mountain summit to mountain summit. In this part of the Flathead Range the peaks are of very irregular form and the ridges much serrated. The greatest altitude is reached at Mt. Haig, 8565 feet and the next at Middle Kootenay North Station, 8197 feet, from which point the watershed descends an eastern ridge to Middle Kootenay Pass.

From the watershed line traversing this section of the survey, long ridges, at right angles to the general trend, extend northeasterly and southwesterly until they are cut off by the valley of the west branch of Castle River on the Alberta side and by the Flathead River Valley on the British Columbia side, flowing respectively north and south, parallel to the range. The ridges are separated by wide, densely-timbered valleys in which tributary streams collect the runoff and flow to the main lateral ones: Macdonald Creek, Gardiner Creek and Cañon Creek to Carbondale River, and three others unnamed to the west branch of Castle River. The most striking ridge is that of which Syncline Mt. is the culminating point, at 8008 feet. It is a station of the triangulation of the Geological Survey and is so named on account of a very apparent physical feature. On the western side, Pollock Creek, two unnamed, Cate Creek, and Pass Creek (local name) flow to Flathead River. The most noticeable ridge here is that culminating in Packhorse Peak, 7923 feet, which stands out, a sharp, heavily-timbered cone with bare crest, as one looks up or down the Flathead Valley.

After leaving Flathead Townsite, the government road crosses the river seven times in the first five miles of its course. It then keeps on the west side on the benches above the river, which flows in a narrow trench presenting numerous cutbanks. At the time of the survey, several gangs of men were working on the construction of the road and it will be a fine one when finished. The road-bed is very soft in places and will require a lot of surfacing; the grades are excellent but, owing to heavy rains, it was, at the time, a veritable bog where it winds through dense forest. The road furnishes a complete line of wagon travel from Crowsnest on the Canadian Pacific Railway to the International Boundary and is a good foundation for a future automobile road, following the western base of the Flathead Range; in the distance to Middle Kootenay Pass it is nowhere more than six miles from the watershed, but not far north of the International Boundary crosses to the east side of the river and is twenty miles west of the watershed. The total distance from Crowsnest to the boundary by the road is about fifty-six miles and from Flathead Townsite is thirty-two miles.

On the eastern side of the watershed, a wagon road leads up the west branch of Castle River to an abandoned oil prospect and a pack trail branches from the wagon road up Carbondale River and joins this road not far from

Miller's ranch, thus keeping up a line of communication on the east side of the range.

The upper portions of the valleys on both sides of the part of the watershed referred to are heavily timbered and, in many places, large trees of good commercial value are seen. In the Flathead valley, below the townsite, are fine stretches of primeval forest containing fir, spruce, cedar, balsam and larch, some of which is of good merchantable proportions. Larch of such size was only seen in the Flathead and tributary valleys; it is the *Larix occidentalis* and is quite a different species from the *Larix Lyallii*, which grows near timberline on most mountain slopes above 6000 feet. The lower portion of the Flathead Valley, near to and across the International Boundary, appears to have been all burned over.

Five stations were occupied by the Topographical division with camera and transit to locate this stretch of the watershed boundary, viz: River Bend, 7764 ft., where the Flathead River turns south, Packhorse Peak, 7923 ft. Pass Creek North, 8060 ft., Middle Kootenay North No. 1, 8197 ft. and No. 2, 8258 ft.

For positions and altitudes of camera stations, as well as general topography and other information, see Atlas, map sheets, Nos. 2 and 3.

#### MIDDLE KOOTENAY PASS

*History and Origin of Name.*—The pass in question is referred to by travellers as Middle Kootenay Pass. It is not shown on any previous map but was undoubtedly known to the Indians, for a faint pack trail, much grown over and littered by windfall, leads to it up a tributary of Flathead River, known locally as Pass Creek. On the Alberta side, the trail descends open slopes and through dense forest to a small tributary of the west branch of Castle River. Castle River was originally known as Southfork River but, by a ruling of the Geographic Board of Canada, the name has been changed on account of the proximity of a striking mountain of turret formation, shown on numerous maps as Castle Mt. Subsequently, the name "Castle" was changed to "Windsor" for the mountain but retained for the river.

*Topography and Characteristics.*—Middle Kootenay Pass is distant sixteen miles from North Kootenay Pass by way of the watershed; in direct distance it lies southeast twelve miles. Like the latter pass it is a narrow defile with scattered scrubby pines growing on its summit. The ascent on the British Columbia side is easy and on the Alberta side, though steeper, the slopes lend themselves to the construction of a wagon road. A prospector of the neighborhood stated that he had an oil claim in Pass Creek Valley and, about three miles from the summit of the pass on the Alberta side were seen the remains of buildings and machinery, where a determined effort had been made to obtain oil by boring at the abandoned prospect previously referred to. From this point a good wagon road leads to the town of Pincher Creek.

The wagon road might be continued over the pass and carried down the valley of Pass Creek to connect with the government road in the Flathead Valley.

There are two main branches of Pass Creek of about the same volume and respectively about five and six miles in length. The trail follows the southerly and larger one.

*Boundary Line.*—No monuments were placed across the pass and no straight-line survey made of it, but the topographical survey was extended to some distance south and two stations occupied in connection therewith; the first, Three Lakes Station, 8184 feet, is on the watershed and the other, Divide Overlook, 8657 feet, a short distance east of it. It was found impracticable to reach more stations from the pass.

From Middle Kootenay Pass the course of the boundary continues southeast for one and a half miles; it then loops southward for three miles when it again turns southeast. On the Alberta side, the drainage from this section is all to the west branch of Castle River and on the British Columbia side to the southern branch of Pass Creek. See *Atlas, map sheet, No. 2.*

On completion of the above work the Topographical division moved across the pass and down the west branch of Castle River to Miller's ranch. A trail was then followed up the main stream of Castle River for some distance, but soon was lost in the dense overgrowth, so the bed of the stream was then followed to within three miles of its source; here a good trail, leading from a forest ranger's camp, over the divide between the east branch of Castle River and the north branch of Blakiston Brook was met and followed down the latter to the main stream and along the same to the junction with the wagon road from the town of Pincher Creek to Oil City. The latter place now consists of three or four log buildings and several borings for oil. The snow-storm, referred to above, now stopped further proceedings and compelled a closing of field work for the season.

#### AKAMINA PASS

Akamina Pass is not included in the instructions issued to the Commissioners as one of the passes to be surveyed, although South Kootenay Pass is. The reason for this is probably found in the fact that it appears upon none of the existing maps of reference issued prior to its survey by the Commission with the exception only of the map of the International Boundary Survey, which has a very limited circulation. South Kootenay Pass, on the other hand, is shown on all such maps. It is somewhat surprising that while South Kootenay Pass appears on Palliser's map of 1863 as Boundary Pass, having been travelled by Capt. Blakiston from west to east, Akamina Pass is not shown at all, nor is there any mention of it in Palliser's or Blakiston's reports, although Flathead Pass south of the International Boundary is referred to by

Blakiston. It is the more surprising, because South Kootenay Pass is approached on both sides by a rough and difficult pack trail and is in reality a mere crossing of the range that will never be suitable for a road, while Akamina Pass is a wide, well-timbered pass about one and a half miles north of the International Boundary. There is a good wagon road over it with a maximum grade of 1 to 8, from an active oil-drilling plant, situated six miles west of the Summit on the British Columbia side, to Oil City on the Alberta side, where drilling was also in progress, and from which place the road leads for a mile down the valley of Cameron Brook; it then crosses a long, low divide to the valley of Blakiston Brook, which it follows to the prairie, emerging suddenly from a timbered valley to absolutely open rolling prairie. It is eleven and a half miles from Akamina Pass to the prairie and thirty-four and a half miles from there to Pincher Station.

The fact that on the British Columbia side, the trail extending from the end of the road follows the valley of Kishinena Creek across the International Boundary into the United States and that the route of travel through the pass is not wholly in Canadian territory may have had something to do with its having been omitted from Palliser's map, and so from later ones for which that map is a foundation; for one can hardly believe such a wide and easy pass as the Akamina to have been altogether unknown.

As already stated, Mr. Cautley's division carried on preliminary work here until stopped by the big snow-storm, when he, also, had to close work for the season. The work done in this connection will be dealt with in the following Chapter, No. 5.

#### MAPS

When preparing the map sheets, Nos. 2, 3, 3A, 4 and 4A, appearing in the Atlas accompanying the report of the Commission, the photo-topographic surveys made by Mr. M. P. Bridgland, D.L.S., in 1914, of the Rocky Mountains Forest Reserve (Crowsnest Forest and Waterton Lakes Park) were utilized for the Alberta side of the watershed and the Commission desires to acknowledge to Mr. Bridgland the very fine detailed information supplied by his maps of such surveys. It may also be mentioned that the Topographical division working on the British Columbia side of the divide is in almost complete agreement where the two surveys adjoined, any differences being so slight as to be of no practical importance.

In the cretaceous area of the Crowsnest coal-fields, west of the watershed, photo-topographical surveys made by Mr. Wheeler in 1900 were also utilized.

## CHAPTER V

### SURVEYS EXECUTED IN 1915

At a meeting of the heads of the Survey Departments of the several governments concerned, held at Edmonton on the 28th May, 1915, it was decided that the representative of the Province of Alberta could equally well represent the Dominion Government, seeing that their interests were identical. In consequence, Mr. J. N. Wallace, the Dominion representative, did not take part in the work of the Commission subsequent to the said meeting. Later, an Order in Council was passed appointing Mr. R. W. Cautley the representative of the Dominion Government as well as of the Province of Alberta.

#### DESCRIPTION OF OPERATIONS

The work of the Commission was carried on as in previous years, R. W. Cautley, D. and A.L.S., in charge of the Survey of the boundary and of monumenting in the passes and A. O. Wheeler, D. and B.C.L.S., of the topographical survey of the watershed and of monumenting where brass bolts were set in the rock near or above timberline. The positions of all established monuments and of the boundary lines between them were mutually agreed upon by the Commissioners.

Mr. Cautley left Pincher Station for Akamina Pass on the 21st June with pack train and a hired wagon. The season had been unprecedently wet and the roads were almost impassable, so that progress was somewhat slow; however, the party arrived at Akamina Pass on the 24th June and took up the work of completing the survey of that pass. The Commissioners having met here in September, 1914, and decided where all the monuments were to be placed, it was possible to commence building them at once and to proceed with the final survey of the boundary. Work was completed by Mr. Cautley's division at Akamina Pass on the 16th July and, on the same day, the party moved down the wagon road to the oil-boring camp, six miles on the British Columbia side.

From this point, the party had to travel about 130 miles to North Fork Pass; first to Crowsnest, via the Kishinena trail and Flathead wagon road, and thence up Alexander Creek and across a divide into Line Creek Valley, of which a branch heads at North Fork Pass.

Having reached Crowsnest and procured fresh supplies of food and cement from Michel, B.C., the party started up Alexander Creek on the 27th July. For twelve miles a good wagon road was followed and then a trail, which grew steadily worse and less distinct, until it became necessary to cut out a new path through the forest. The wagon road forks about nine miles from

Crowsnest and, from subsequent knowledge, it was evident that Mr. Cautley followed the wrong fork, thus missing the more travelled trail up the western branch of Alexander Creek. Both trails are much overgrown and obstructed by fallen timber. The main result of following the wrong fork of the wagon road was that the party crossed the branch of Line Creek flowing from North Fork Pass too high up and so missed the old trail leading to it, which was almost completely obliterated at the point of crossing. Subsequently, it took three men three days to cut out the four miles of trail leading up this branch of Line Creek to North Fork Pass. The party now crossed a dividing ridge between two branches of Line Creek and found a better trail, which led to the summit of Tornado Pass. From the 28th July until the 6th August, the division was engaged in exploring and cutting trail through very bad country.

Mr. Cautley commenced work at Tornado Pass under the impression that it was North Fork Pass, and it was not until Mr. Wheeler arrived on the 9th August that he became aware of his mistake. In 1913, Mr. M. P. Bridgland, D.L.S. had made a photo-topographical survey of the Crowsnest Forest, situated on the Alberta side of the watershed, and had then located North Fork Pass. Mr. Wheeler had a copy of Mr. Bridgland's map and was thus in a position to point out that North Fork Pass lay about three miles southwest of Tornado Pass. In view of the facts that Mr. Cautley had already completed most of the preliminary work and that Tornado Pass has easy approaches on both sides—more so than the North Fork Pass—it was decided to complete the survey. Field-work here was finished on the 17th August and a move made by the trail following the valley of Dutch Creek, on the south or Alberta side of Tornado Pass, to the trail branching from it to North Fork Pass and up that trail to the summit of the pass, a total distance of five miles. Both trails were badly blocked by fallen timber and had to be cut out. Work was completed at North Fork Pass on the 28th August. The two passes were closely connected by triangulation and a tie made with the Dominion lands surveys on the Alberta side of the watershed.

The division now moved over North Fork Pass and down Line Creek, by the trail which it had opened up, to the Elk River wagon road, a distance of eleven miles. Having replenished supplies at Michel and obtained teams to freight them to the end of the wagon road at Weary Creek Camp, fifty-eight miles from Michel, a move was made on the 1st September for Elk Pass. From the end of the road a fair pack trail leads for twenty-four miles to the divide of the watershed between the headwaters of the Elk and Kananaskis Rivers, which your Commissioners have called Elk Pass. The division arrived here on the 6th September and commenced preliminary work. Mr. Wheeler arrived on the 18th September and, the preliminary work having by that time been completed, the Commissioners were able to decide upon the location of all the monuments it was necessary to erect.

September weather in the mountains is always liable to be bad and this month was particularly so; eleven inches of snow fell on the 9th and it snowed

on nine different days before work was completed at the pass, besides a great deal of rain, so that most of the time the ground was covered by snow. It is necessary to take special precautions against frost when building concrete monuments during such weather; some of them were built under a tent put up for the purpose, but the most satisfactory way seemed to be to heat rocks in a log fire during the afternoon, put them in a shallow trench dug around the monument and, just before dark, cover them over with dry soil; the monument and trench are then covered with canvas pack-covers, the edges of which are weighted to the ground with stones and soil. When this has been done and the concrete mixed with warm water, the frost does not seem to hurt and the only possible trouble is that the concrete is liable to dry out rather too quickly.

By dint of working in all weather, field-work was completed at Elk Pass summit on the 5th October, and on the 6th the division broke camp and proceeded to Morley, a station on the main line of the Canadian Pacific Railway, fifty-seven miles distant by trail from Elk Pass, where the men were paid off on the 11th of October.

The Topographical division left Pincher Station on the 2nd July and arrived at Akamina Pass on the 4th. From that date until the 8th, the party was engaged making a photo-topographical survey of the summit of the pass and its vicinity. It then moved to Blakiston Brook and surveyed the watershed between Akamina and South Kootenay Passes, continuing northward to close with the work done at Middle Kootenay Pass the previous season. Work was concluded here on the 25th July and the division travelled to Crowsnest Pass, arriving on the 28th.

From Crowsnest Pass, the survey of the watershed and vicinity was carried north, travelling by the wagon road up Alexander Creek and by the trail cut out by Mr. Cautley, to Tornado Pass, where the party arrived on the 12th August. From that date until the 22nd, work was carried on in the vicinity, covering both the Tornado and North Fork Passes and joining up the survey of the watershed with that carried northerly from Crowsnest.

On the 23rd August, the division camped at the junction of Tornado and Line Creeks and continued the survey northwesterly. The main valley of Line Creek, which lies on the British Columbia side, parallel to the watershed, furnished a good line of travel and, crossing a divide to the valley of Ewin Creek, that valley was descended and connection made with a good trail up Fording River Valley. Fording River, for nearly the whole of its course, parallels the watershed and a number of streams of considerable size flow from the crest of the range to join it. The valleys of these tributary streams furnished excellent facilities to approach the watershed and carry on the work of the survey.

On the 7th September the first snow came in the valleys and completely covered the higher altitudes. The last camp made in this section was at the junction of Fording River, here a small stream, and a stream flowing from Fording River Pass. Fording River Pass is a high crossing of the watershed,

situated about two miles north of Mt. Courcelette. The work was carried to the head of Fording River and a number of camera stations occupied, but not very satisfactorily, as the whole country was covered by snow and was in a very poor condition for photographing, while dull days and clouds hanging low over the mountains added further to the difficulty of obtaining useful results.

From the 18th to the 21st September, Mr. Wheeler was at Elk Pass with Mr. Cautley, but returned to Fording River on the 22nd. On the 26th, a party made the ascent of Mt. Courcelette, which was covered with snow, and occupied a station on its summit.

The division next moved by trail from Fording River to Aldridge Creek and, by the valley of that stream, to the Elk Valley road, then, by way of the road and trail beyond it, to Elk Pass, arriving there on the 28th September.

A topographical survey was now completed of Elk Pass and its approaches, and a number of stations were occupied to supplement Mr. Campbell's reconnaissance survey made in June, 1914. All the necessary brass bolts were placed and cairns erected over them, with the exception of one on the summit of the high peak dominating the pass on the west side which, owing to the snowfall, was in too dangerous a condition to risk a climb.

On the 2nd October the division closed field-work and started for Banff by way of the Kananaskis Lakes route on the Alberta side of the Elk Pass. About a mile north of Lower Kananaskis Lake a trail, very indistinct and much littered by windfall at the start, leads up the west branch of Kananaskis River; this was followed to the Mud Lake divide, from which a tributary stream flows to Spray River, joining it a short distance southwest of Lower Spray Lake. From the junction, a well-travelled pack trail follows the valley of the Spray Lakes, on the east side of the Goat Range, and joins a good wagon road on the west side of Spray River that leads direct to the village of Banff, some seven miles distant. The Spray River, on a course half a mile west of Lower Spray Lake, flows at the western foot of the Goat Range until, passing through a narrow gap in the range, it transfers its course to the east side close by where the trail joins the wagon road.

#### AKAMINA PASS

*History and Origin of Name.*—The summit of Akamina Pass is situated one and a half miles north of the International Boundary. Directly where the continental watershed crosses the boundary lies a bold rock escarpment, facing north-easterly. It is hollowed out in a series of very striking semi-circular amphitheatres, whose curving walls embrace a number of lakes of various sizes. Two, immediately west of the watershed, are known as Forum Lake and Wall Lake; the first is a name bestowed by the Commission and the second, one of local application; both names are eminently suitable. The streams flowing from these two lakes, together with one from the north

side of the summit of the pass, unite within a few miles and form the extreme source of Akamina Brook, which, after a run of some eight miles, joins Kishinena Creek.

There is very little information available as to the origin of the name "Akamina," which seems to be an Indian word. It was applied to a joint astronomical station occupied by the British-American Boundary Commission, in 1861. In the Boundary Report of that Commission, it is referred to as "Akamina Camp and Astronomical Station"; later the name was applied to the brook and, still later, to the pass.

Cameron Lake



AKAMINA PASS SUMMIT  
Looking South

*Topography and Characteristics.*—The general direction of the summit portion of Akamina Pass lies east and west. The bottom, or floor, of the pass is here about fifty chains wide, but the actual summit, that is the lowest part of its cross-section, which has an altitude of 5835 feet above sea-level, is in a narrow ravine at the southern edge of the floor and at a depth of sixty feet lower than its average level; from the ravine, steep hillsides rise continuously to the south. The distance between the crests of the containing mountain ridges is approximately three miles. On the south side the pass is bounded by a precipitous rock escarpment, from which a very striking, narrow rock

ridge stands out at right angles like a gigantic causeway. Up this the watershed line ascends to the crest of the rock wall and shortly after crosses the International Boundary, which closely follows the forty-ninth parallel of latitude. On the north side of the pass, slopes of broken rock rise very steeply to the crest of the bounding ridge.

Directly below the rock escarpment, on the east side of the watershed ridge, lies Cameron Lake, a picturesque sheet of water, one mile and a half long by half a mile wide. The drainage from the summit of the pass is to

Mt. Blakiston



AKAMINA PASS SUMMIT  
Looking North

the lake and its outlet, Cameron Brook, a stream of considerable size, which flows to Upper Waterton Lake. The Waterton Lakes empty by way of Waterton River into Oldman River and so by the Saskatchewan River, Lake Winnipeg and Nelson River to the Arctic Ocean. As already stated in Chapter IV under "Akamina Pass," there is a good wagon road across the summit of the pass to oil borings about six miles down on the British Columbia side. This road branches from the main road from Pincher Station, on the Canadian Pacific Railway, to the hotel at Upper Waterton Lake and travels up Blakiston Brook for three miles; it then turns southwesterly and, crossing a divide

of 5300 feet altitude between that stream and Cameron Brook, follows the latter in a southwest direction past Oil City to a short distance below Cameron Lake, whence it ascends a steep hill, by easy gradients, over the summit of the pass.

On the British Columbia side the drainage is collected by Akamina Brook, a tributary of Kishinena Creek, and, as far as the junction of the two streams, the direction is northwesterly; from that point the trend of Kishinena Creek Valley is southwesterly. The creek crosses the International Boundary and, about four miles farther on, flows into Flathead River, which joins the Columbia and thus arrives at the Pacific Ocean. The approach to the pass on this side of the watershed is by the Kishinena and Akamina Valleys and it can only be reached from the United States. It is unfortunate that this approach does not lie wholly in Canadian territory for the pass is eminently suited for either a road or a railway.

*Boundary Line.*—The Characteristic letter of Akamina Pass is H. Monument 1 H is situated on a little knoll about two chains north of the summit in the ravine and fifty feet above it; owing to the swampy nature of the ravine and the fact that a monument built in it would be hidden from any point on the boundary a short distance away, it was considered inadvisable to build a monument at the actual summit of the pass.

On the north side of Monument 1 H, Monuments 2 H, 4 H, 6 H and 8 H were built. Monument 4 H was used as a point of observation to the local meridian of which all bearings of the survey are referred. From Monument 8 H, a straight-line course was run to Brass Bolt and Cairn 10 H, and from that point a final straight-line course to Brass Bolt and Cairn 12 H on the summit of the northern bounding ridge. Bolt 10 H, altitude 7631 feet, is at the edge of a steep descending slope, and is 1350 feet above Monument 8 H; it also happens to be very near timberline, here about 7700 feet above sea-level.

On the south side of Monument 1 H, the boundary follows for about a mile the long, continuously rising ridge, referred to as resembling a gigantic causeway, broad at the base and gradually narrowing to a sharp edge where it joins the rock escarpment. This ridge falls steeply to Cameron Lake on the east and but little less steeply on the west to the small lake named Forum Lake by the Commission, on account of the immense wall of rock that surrounds it. On the ridge, concrete Monuments 3 H and 5 H were built, the final straight-line course extending from Monument 5 H near timberline, which on this side of the pass summit is several hundred feet lower, to Brass Bolt and Cairn 7 H on the crest of the escarpment.

Seven concrete monuments were erected, and the total length of the straight-line boundary surveyed was 257.19 chains. Four brass bolts were placed and rock cairns built over them, 9 H being on the highest point of the south bounding ridge crossed by the watershed. From 9 H the watershed line descends rapidly to Monument No. 272, erected by the International

Boundary Commission at the intersection of the watershed line with the International Boundary.

Akamina West, 8446 ft., 7 H, 7884 ft., 9 H, 7922 ft., 10 H, 7631 ft. and 12 H, 7968 ft. were occupied as camera stations by the Topographical division.

At the end of the report will be found views of the concrete monuments and cairns over brass bolts that have been erected, descriptions also, of the positions of the brass bolts placed and a table of latitudes and departures referring them to the nearest concrete monument. For positions and altitudes of monuments and bolts, as well as for general topography, see Atlas, map sheets, Nos. 1 and 1 A.



INTERNATIONAL BOUNDARY MONUMENT, NO. 272

*Tie with Land Surveys.*—Direct connection, by traverse, was made with the northeast corner of Section 10, Township 1, Range 1 west of the Fifth meridian, which is only about half a mile east of the boundary. Connection was also made, by triangulation, with Monument No. 272 of the International Boundary. It is an interesting fact that the intersection of the watershed with the International Boundary occurs on the flat summit of a little grassy col, with a few larch trees upon it, which makes a gap between two steep ridges of rock. No more suitable spot could have happened for the International Boundary to cross the main range of the Rockies, and the iron pillar erected there to a height of six feet is visible from many miles distant, both north and south.

*General Remarks.*—On the British Columbia side the pass is thickly clad with pine, spruce and fir at its lower levels, extending well into the tributary valleys; at higher levels, near timberline, spruce, balsam-fir, balsam and Lyall's larch are seen. Some of the timber is of fair size and will be serviceable

for use in connection with the development of oil wells in the vicinity, should borings that are being made prove successful. On the Alberta side, except on the slopes leading to the summit of the pass and adjacent thereto, the timber is much less dense and the poplar of the eastern foothills is conspicuous; much of the area, also, has been burned over and is now seen in the dreary garb of dry standing sticks in a litter of windfall.

Mountain goats are numerous on the high rocky crests, particularly so along the rock escarpment on the south side of the pass. Deer are everywhere in the forest and one was photographed browsing amongst the tents of Mr. Cautley's camp. A grizzly bear was seen trying to tear down Monument

Mon. 272 on Col



SHOWING COL WHERE WATERSHED INTERSECTS INTERNATIONAL BOUNDARY

8 H; he sat up on the base of the monument and endeavoured to wrench the top off, failing which, he bit it and left deep tooth marks grooved in the metal covering. It is needless to state that these operations were watched through a transit at a safe distance. Brown bears also, were in evidence, and one that Mr. Wheeler came on suddenly was in such a hurry to get away that he rolled head over heels down a steep grassy slope. Wall Lake is well stocked with trout of small size and people come there to fish; a trail leads to it from the Akamina Road.

#### AKAMINA PASS TO SOUTH KOOTENAY PASS

Leaving Brass Bolt and Cairn 12 H, the watershed line follows the crest of a long ridge, northwesterly, to South Kootenay Pass. The ridge presents several higher elevations, of which the secondary triangulation station of the

Geological Survey, known as Mt. Festubert, is the highest, rising to an altitude of 8274 feet; this point is a little more than two miles southeast of South Kootenay Pass.

On the Alberta side, the ridge presents a bold rock escarpment, with steep shale slopes at its base; about a mile and a quarter northwest of 12 H, a height of land projects from it, which divides the waters flowing to Cameron Brook from those flowing to Blakiston Brook. Three small lakes lie in amphitheatres along the east side of this height of land. On the British Columbia side, the run-off drains to Akamina Brook and beyond Mt. Festubert creates the headwaters of Kishinena Creek. East of the watershed, the heads of the valleys show a dense growth of timber; on the west side the slopes are not so steep and there are great beds of shale and some wide, plateau-like stretches where the rock formations have a wild, fantastic appearance. Here, the timber is small, scrubby and scattered, and it is not until the trough of Akamina Brook is reached that the valley again shows a thick timber covering such as is seen near the source of the brook at Akamina Pass.

Camera Stations, Akamina North, 8225 ft. and Mt. Festubert, 8274 ft. (Geological Survey Station), both on the watershed, were occupied to obtain data to map this portion of the work; for their positions, see *Atlas, map sheet No. 1.*

#### SOUTH KOOTENAY PASS

This so-called pass is merely a lower elevation of the watershed ridge and there is no distinct gap. It appears on Palliser's Map (1863) as Boundary Pass and has since been shown on all published maps of the vicinity as South Kootenay Pass. The significance it has acquired as a pass is probably due to its being a route of travel for the "Kootanie" Indians when on their way to the prairies of Alberta to hunt buffalo, who preferred it to the North Kootenay Pass when they had heavily loaded pack animals, on account of its easier slopes of approach; also to the fact that it was traversed by Capt. T. Blakiston in 1858 on his return from a visit to the "Kootanie" Indians at Tobacco Plains. Capt. Blakiston does not appear to have been aware of the existence of Akamina Pass and, believing that the pass in question was next to the International Boundary, also, perhaps, because its western approach crossed that boundary, gave it the name of Boundary Pass in his report to Capt. Palliser. The Indians probably used it in preference to Akamina Pass on account of its being a more direct line of travel to their objective point, and thus it became known as South Kootenay Pass in contradistinction to their more northerly line of travel over North Kooteray Pass.

The summit of South Kootenay Pass is computed by the Topographical division at 6903 feet altitude above sea-level; it is seven and a half miles north of the International Boundary and about eight and a half miles from the summit of Akamina Pass by way of the watershed. From the east it is approached by the valley of the south branch of Blakiston Brook and on the

west from the United States by the valley of Kishinena Creek; the approaches to the pass, therefore, are not wholly Canadian, but it is possible from its summit to travel northwesterly along the ridge and so make connection with a trail which follows the valley of Sage Creek and joins the British Columbia Government road in the Flathead River Valley.

On both sides the approaches to the summit of this crossing of the Divide are very steep; the trail is rough and being practically untravelled is almost obliterated; it branches from the main trail up the north branch of Blakiston Brook and, leading over the pass down the valley of Kishinena Creek, joins the trail from the end of the wagon road over Akamina Pass.



SUMMIT RIDGE OF SOUTH KOOTENAY PASS  
Looking North

As there seemed little likelihood that the pass would be of any economic utility in the near future, your Commissioners did not consider the expense of a special survey of the watershed would be warranted, so no monuments were placed across it.

#### SOUTH KOOTENAY PASS TO MIDDLE KOOTENAY PASS

From the summit of South Kootenay Pass, the course of the watershed is northwest for two and a quarter miles and passes over a high point which has been occupied as South Kootenay Pass North Camera Station. It then turns northeast for a mile to a point 7500 feet in altitude, when it again resumes its general northwest direction for a distance of five miles; in the latter course

it travels over two peaks considerably higher than the general altitude of the ridge, viz: the peak where Sage Creek Camera Station is located at 7992 ft. and Font Mt., 7719 ft., and terminates on the summit of a peak of 7900 feet altitude. From the last mentioned point, the line swings nearly west for approximately three and three-quarter miles on a very erratic course. It now proceeds northwesterly, two and a quarter miles, to Province Divide Camera Station, 7929 ft., having first passed over Province Divide South Station, 7833 ft. From Province Divide Station, the watershed loops on a course, only a little north of west, four and three-quarter miles, passing over several crests of over 7500 feet to a point established by the topographical survey

Valley of Blakiston Brook

Summit of Pass  
Mt. Festubert StationSUMMIT RIDGE OF SOUTH KOOTENAY PASS  
Looking South

southward from Middle Kootenay Pass, altitude 8500 feet, and from which the course of the watershed is northward for three miles and then northwest for one and a half miles to the summit of Middle Kootenay Pass; see Chapter IV, under "Boundary Line, Middle Kootenay Pass."

The distance from South Kootenay Pass summit to Middle Kootenay Pass summit by the sinuous course of the watershed is twenty-four miles, but in a direct distance northwest is fifteen and two-thirds miles.

From the crest of the peak on which South Kootenay Pass North Camera Stations No. 1, 7950 ft. and No. 2, 7993 ft. are set, a ridge extends easterly and divides the waters of the north and south branches of Blakiston Brook. Mt. Blakiston, 9600 ft., the highest peak of the vicinity, rises south of the

south branch, some five miles from the pass summit in a direction a little south of east. From the peak on which Sage Creek Camera Station is established, a ridge extends easterly and circles northward to enclose the basin in which the waters tributary to Castle River have their source. Both at the heads of the branches of Blakiston Brook and of the streams tributary to Castle River many little lakelets are seen. From the peak of the watershed at Province Divide Camera Station, Barnaby Ridge extends a little west of north and divides the catchment basin of the west branch of Castle River from that of the main stream.

On the British Columbia side, the largest portion of the area abutting on this section of the watershed is taken up by the wide basin of Sage Creek and its many tributary streams, separated by broad, more or less timbered ridges at right angles to the course of the main stream. From the peak of South Kootenay Pass North Station, a ridge runs on a general westerly course and divides the waters of Sage Creek from those of Kishinena Creek. Again, from a high point of the watershed, a mile and a half west of Province Divide Station, a ridge extends southwesterly between the drainage to Sage Creek and that to Commerce Creek. All three of the streams named are tributaries of Flathead River.

Within the basin of Sage Creek, three other camera stations were occupied, viz: Sage Creek Bend, No. 1, 7167 feet, No. 2, 7190 ft. and Sunkist Station, 7727 feet. For positions and altitudes of these stations, as well as for general topography, see Atlas, map sheets, Nos. 1 and 2.

#### GENERAL REMARKS ON THE BOUNDARY FROM AKAMINA PASS TO MIDDLE KOOTENAY PASS

All the valleys of the streams referred to above, on both sides of the watershed, are well timbered at their heads with the usual varieties: spruce, balsam and larch, to an average altitude of about 7500 feet; at lower elevations, pine and spruce of commercial value are found on the Alberta side, and spruce, fir, pine and cedar on the British Columbia side.

Shortly before Sage Creek enters the Flathead River Valley, the basin it drains contracts and the stream flows through a narrow gap in the range of mountain heights forming the eastern boundary of the Flathead Valley. An oil drilling plant has been for some time in operation at a point just outside the gap, and many oil claims have been staked on Sage Creek and on the larger streams in the vicinity.

The section of the Rocky Mountains here referred to is largely composed of reddish-brown sandstones and conglomerates, overlain by the limestone in the higher formations; the peaks and ridges present wonderful towers and turrets and, in some cases, their crests are carved into unique and striking shapes; where bold precipitous rock-faces are exposed, the strata are seen to

be much contorted. It is a somewhat peculiar fact that this reddish-brown formation appears to terminate very close to the International Boundary; south of it the whole aspect of the region changes: the peaks present limestone faces, considerable quantities of snow are seen and glaciers lie in amphitheatres enclosed by the ridges. The aspect becomes a truly alpine one and a number of large lakes, presenting waters of beautiful blue and green colours, the result of the infusion of glacial silt, are seen; particularly prominent are Upper and Lower Kintla Lakes, and the Boundary Mountains, clad in snow, rise very conspicuously. This section, south of the Canadian Boundary, comprises the much advertised Glacier Park of the United States. Northward of the boundary, the peaks, with a few exceptions, are of a lower altitude and present the uniform reddish-brown colouring, little relieved by snow, which has been referred to, while long timbered ridges are much in evidence.

The game of the district has already been mentioned, but it may be added that the north branch of Blakiston Brook to near its source and the west branch of Castle River are both well stocked with trout: fish up to six pounds in weight were plentifully caught by the Topographical division.

#### CROWSNEST PASS TO NORTH FORK PASS

North of Crowsnest Gap, the continental watershed follows the crests of the High Rock Range. Between this range and the Livingstone Range, which parallels it on the east, lies the Crowsnest Trough. The Livingstone Range forms the eastern escarpment of the Rockies, rising abruptly above the timbered foothill areas separating it from the open prairies. On the west side of the High Rock Range is the Elk River Trough, presenting a broad, parallel valley, or rather, series of valleys separated by high ridges of serrated limestone, or of lower sandstone and shale hills. Originally well timbered, the Elk River Valley now presents much open land, a large proportion of the timber having been killed by forest fires. The river practically forms the boundary between the cretaceous or coal-bearing area and the limestone series, and almost directly from its western bank rises the bold escarpment of a range of limestone peaks. On the east side the slopes of the valley rise to the high intervening ridges referred to, which are cut at intervals by streams draining the minor parallel troughs of Alexander Creek, Grave Creek, Line Creek and Fording River. All the cretaceous areas of the Crowsnest and Elk River Troughs are underlain by beds of bituminous coal and much prospecting has been done, although no established industries are in operation, beyond the line of the Canadian Pacific Railway.

Crowsnest Pass and Phillipps Pass, the small pass a mile or so north of it, have been dealt with in Chapter IV of this report. From the summit of Phillipps Pass, the watershed line ascends the slopes of Mt. Phillipps to the highest point of its northwestern ridge, altitude 8204 feet above sea-level. It then travels, a little west of north, two and three-quarter miles along the

ridge to its most northerly corner, on which Phillipps Ridge North (g) Camera Station was occupied at 7671 ft.; here, turning northeast, the watershed descends sharply about a mile to the summit of a small pass, from which point it continues in the same direction one and a half miles to the crest of the dominating peak, altitude 8300 feet.

The pass referred to is a narrow gap in the range lying northwest and southeast; its summit is 5400 feet and it is densely timbered. A trail is said to lead through this pass from the wagon road up Alexander Creek on the British Columbia side to the pack trail in Allison Creek Valley on the Alberta

Crowsnest Mt.



SMALL PASS NORTH OF MT. PHILLIPPS  
Alt. 5400 ft.

side, a distance of about four miles. The pass lies four and a quarter miles due north of Phillipps Pass, from summit to summit.

The watershed now loops north about two miles to the highest point of Allison Peak, 8671 feet, on the way passing over a peak of 8500 feet. It continues in the same general direction one and three-quarter miles to a peak of 8200 feet altitude, from which point it falls three-quarters of a mile to the summit of another small pass over the watershed at 6900 feet altitude. The valley of this little pass opens on the west to that of Alexander Creek and on the east is the source of one of the tributaries of Racehorse Creek. On the north side of the pass, the watershed rises, on a course a little east of north,

(g) Shown on Sheet 4 as Wilson Ridge N. See note (a) on page 57

three-quarters of a mile to the summit of the dominating ridge at 8700 feet altitude. From this point the general course is north for about three and a half miles to a peak of 8300 feet, crossing in its passage four peaks varying from 8500 ft. to 9000 ft. The bearing now changes to west of north and continues in that general direction about five and a half miles to the summit of Mt. Erris, 9320 feet; in passing, it crosses four other peaks ranging from 8400 ft. to 8800 ft. From the summit of Mt. Erris the watershed descends nearly two and a half miles along its north ridge to the summit of North Fork Pass, on the way passing over an outlying elevation on which Monument 7 L is placed.

On the Alberta side of the above described section of the watershed, Allison Creek and its confluent streams empty into Crowsnest River, a tributary of Oldman River; Racehorse and Dutch Creek, with their confluent, flow direct to Oldman River. These three streams carry the entire run-off of the area. On the British Columbia side the drainage is chiefly to Alexander Creek and, north of the headwaters of that stream, to Line Creek; the former flows to Michel Creek, a tributary of Elk River, and the latter direct to Elk River. Alexander Creek lies in one of the minor troughs parallel to the crest of the High Rock Range and is about three miles from it; Allison Creek also parallels the watershed at a distance of from one to three miles, while the other streams flow more or less outward from it.

Between the heads of Alexander and Line Creeks there is an open grassy summit; six and a half miles down stream from this summit the western branch of Alexander Creek, after a run of about four miles from a little lake at its head, unites to form the main stream. A wagon road branches from the main Crowsnest-Michel road and leads for eight and a half miles up Alexander Creek to the forks of the stream. The road then continues up both branches for a distance of between two and three miles to where, in each case, log buildings, bunkhouses, stables, etc., have been built near the mouths of shafts driven into the hillside to prospect for coal. There are other prospect tunnels in the valleys of the streams tributary to Alexander Creek and considerable work in this connection appears to have been done.

An old pack trail goes up the west branch of the creek from the end of the road and, passing by the headwaters of Grave Creek, connects with a pack trail from the Elk Valley Road up Line Creek Valley and a tributary thereof to North Fork Pass. A less used trail also leads from the end of the road up the east branch of Alexander Creek to the grassy summit referred to, but there is lost and a new path through the forest was cut out by Mr. Cautley's division, following a tributary of Line Creek and connecting with the trail to North Fork Pass above referred to. All these trails are practically out of use and had to be cleared of windfall and overgrowth before they could be travelled; they furnished an inside line of travel that served well the purposes of the Topographical division and enabled the watershed to be approached and surveyed.

On the Alberta side, a pack trail branches from the main road along the railway, near Sentry Station, and goes up Allison Creek Valley across the divide between it and Racehorse Creek Valley, which it follows to where the two most westerly main branches of that stream unite; it then follows the northerly one across a divide to Dutch Creek and joins a pack trail up that stream to North Fork Pass summit, which it crosses and is then the trail previously referred to as leading from the Elk Valley Road up Line Creek and one of its tributaries to the pass. It will thus be seen that there are



GRAVE CREEK GAP, Looking West  
Opening to Elk River Valley

continuous lines of travel for pack-horses on both sides of the watershed, not far from the crest of the range.

Erickson Ridge forms the western slopes of Alexander Creek Valley and also the eastern slopes of Elk River Valley; it is, in fact, the most southern of the intervening ridges of the Elk River trough, which are separated from one another by the gaps of Grave and Line Creeks and of Fording River. The Erickson Ridge presents, for the most part, a sandstone formation, with limestone caps and beds of shale on the higher parts. The upper portion of Alexander Creek Valley and its side slopes are thickly covered by green timber, but many patches of brûlé and windfall are seen along its floors and on the Erickson slopes. The timber at the lower elevations is of good commercial

value and much has been used to feed a sawmill situated close to the railway where the course of Alexander Creek turns sharply from south to northwest. A similar covering of green timber is found at the heads of Grave and Line Creeks and in the valleys along the watershed on the Alberta side.

Camera stations were occupied at Phillipps Ridge North, 7671 ft., Mt. Erickson, 8138 ft., Erickson Ridge Centre, 8128 ft., Erickson Ridge North, 8196 ft. and Alexander Summit East, 8285 feet. For positions of these stations as well as for general topography, see Atlas, map sheets, Nos. 4 and 5.

#### NORTH FORK PASS

*History and Origin of Name.*—The North Fork Pass was traversed in 1884 by the late Dr. George M. Dawson, C.M.G., Director of the Geological



LINE CREEK GAP, Looking West  
Opening to Elk River Valley

Survey of Canada, and the name was given to it by him; so far as is known, it had not previously been crossed except by Indians. The name is due to its providing a feasible line of travel across the Main Range from Elk River Valley to the valley of the stream shown as the "North Fork Old Man River" on Dawson's Map of a portion of the Rocky Mountains, published by the Geological Survey in 1886. The term "North Fork" was applied by him to distinguish this branch of "Old Man River" from the "South Fork" of the same stream, which heads on the east side of the watershed not very far north of South Kootenay Pass and joins the "North Fork" a few miles north west of Pincher Station on the Canadian Pacific Railway. The name "South Fork Old Man River" was subsequently changed to Southfork River and again, quite recently, to Castle River. For the northern branch, the term "North Fork" has been dropped and it is now known as Oldman River.

*Topography and Characteristics.*—North Fork Pass lies in a general east and west direction. The altitude of the lowest part of its summit is 6537 feet above sea-level. The pass is approached from the east by the valley of Dutch Creek, a tributary of Oldman River, which it joins about two and a quarter miles north of the gap in the Livingstone Range through which the river flows. Dutch Creek is shown on Dawson's map as the "West Branch."

The valley of Dutch Creek is fairly well wooded throughout and, on the slopes directly below the pass, densely so all the way to the summit. The prevailing species are pine (*Pinus Murrayana*), spruce and balsam; Lyall's

Summit of Pass



NORTH FORK PASS (6537 ft.)  
Looking Southwest

larch is found near timberline and some Douglas fir at the summit of the pass. Open grassy slopes are seen on the hillsides looking north and, along the valley bottoms, numerous open glades with little grassy meadows; one of these open spaces on the north side of the valley is an extensive prairie of about a square mile in area.

A good pack trail leaves the wagon road in Oldman River Valley and leads up Dutch Creek to the summit of North Fork Pass. Shortly before the final ascent to the pass is commenced, a branch trail separates from it and continues to the head of Dutch Creek and over Tornado Pass; the latter trail has been little travelled and had to be cut out before it could be used by the survey parties.

On the west side of North Fork Pass, at some distance from the summit, the drainage collects in a small stream, which is soon joined from the south by a larger tributary of Line Creek, flowing from an amphitheatre enclosed by the north and west ridges of Mt. Erris; the trail travels along the valley of these two streams to their junction with the main stream and then close to its bed through a narrow, rocky defile in an abrupt range of limestone peaks, referred to previously as one of the intervening ridges of the Elk River Trough;

Bolt 5 L  
Mt. Erris Bolt L 7



SUMMIT OF NORTH FORK PASS (6537 ft.)  
Looking South

soon after the trail joins the Elk Valley Road. This ridge of limestone peaks is shown on Dawson's map as the "Wi-suk-i-tshak Range."

The summit of the pass consists of a rock ledge extending right across, from side to side. A somewhat curious feature is, that no water was discovered within half a mile of the summit and it was necessary, while making the survey, to camp about 600 feet below it, on the east side, where there was a small spring. There is an open meadow and a timbered plateau beyond, which are only about twenty-five feet lower than the summit and which extend thirty

chains from it on the west side, and then, for several miles, dense pine and spruce timber, greatly obstructed by windfall. Farther down, this gives place to much open land along the valley bottom and on the north slopes, where forest fires have destroyed the timber; here, small poplar and jack pine sparsely cover considerable areas and more-freshly burned tracts of brûlé and windfall are of frequent occurrence.

The pass summit is a narrow, shallow defile with no level bottom land; the eastern descent falls swiftly for about 550 feet of altitude and the trail zig-zags down it; the western descent lies along the north slopes of the valley and is much more gradual. To the north, very steep slopes rise to timberline and then a stretch of open grass land to limestone rock, which rises less steeply in jagged edges and broken blocks to the crest of the peak dominating the pass; this peak is at the south end of a ridge containing Tornado Pass on the west side, and upon it, Monument 6 L was placed. South of the summit, the north ridge of Mt. Erris rises in more gradual slopes, intercepted by a number of short, steep ascents, to the crest of an isolated elevation of the ridge, dominating the pass, and upon which, Brass Bolt and Cairn 7 L has been placed; the ridge is well-timbered and falls precipitously on the east side.

*Boundary Line.*—North Fork Pass is designated by the letter L. Concrete Monument 1 L is built on rock, a few feet north of the actual summit and about ten feet above it. Two other concrete monuments were built, one on either side. Toward the north, concrete Monument 2 L was built; from 2 L, a straight-line course was run to Brass Bolt and Cairn 4 L, and a final straight-line course from 4 L to Brass Bolt and Cairn 6 L, which last is on the summit of a peak of the main range, overlooking Tornado Pass, at an altitude of 8643 feet. Toward the south, concrete Monument 3 L was built; from 3 L, a straight-line course was run to Brass Bolt and Cairn 5 L. Brass Bolt and Cairn 7 L was placed, at an altitude of 8415 feet, on the north end of the isolated hill referred to above as rising on the north ridge of Mt. Erris, from which it is separated by a sharp dip in the ridge. The total length of straight-line boundary surveyed in North Fork Pass is 125.85 chains.

Camera stations were occupied by the Topographical division at Bolts 4 L, 6 L and 7 L.

At the end of the report will be found views of the concrete monuments and cairns over brass bolts that have been erected, descriptions also, of the positions of the brass bolts placed and a table of latitudes and departures referring them to the nearest concrete monument. For the positions and altitudes of monuments and bolts, as well as for general topography and other information, see Atlas, map sheets, Nos. 5 and 5 A.

#### TORNADO PASS

*History and Origin of Name.*—Directly above the summit of Tornado Pass, forming its eastern wall, rises the loftiest peak of the High Rock Range. The peak has been known locally as Gould Dome, but recently the name

Tornado Mountain has been given to it by the Geographic Board of Canada; for that reason the pass which it dominates is named Tornado Pass. The altitude of the mountain as computed by the Topographical division is 10,169 feet above sea-level.

*Topography and Characteristics.*—Tornado Pass summit lies almost due north and south, at an altitude of 7096 feet above sea-level, and is formed by a break in the main range to which the axis of the pass is roughly parallel. In form, the summit is a U-shaped trough, a little more than a mile wide, from rim to rim.



TORNADO MT.—Looking North

The upper portion of the pass is of a delightfully alpine character, presenting open grass-lands and groves of spruce on both sides of the watershed. The southern approach is particularly attractive and meadow-like glades, in which flow little crystal streams, interspersed with open belts of graceful spruce and larch trees, charm the eye. The northern approach also presents numerous alpine meadows but is somewhat marshy and is marred by the unsightly relics of a forest fire. A narrow, open flat marks the pathway of the pass across the watershed and steep slopes rise abruptly on either side to towering precipices and crags of rock, below which constant attrition has piled immense quantities of scree. It is a veritable gateway through the High Rock Range and, at first

glance, the passage northward would seem to be barred to farther progress by the encircling ramparts of mighty hills. The pass summit is most picturesque and grandly impressive in its surroundings. The precipices of Tornado Mt. rise fully 2500 feet and the gigantic rock buttresses that stand out, separated by huge, cavernous chimneys, are awe inspiring. On the west side, the peak of 7 K, though fully a thousand feet lower is hardly less impressive. Tornado Mt. is a storm centre of the locality and, on the occasion of two ascents, the party had narrow escapes; first, through a cloud-burst accompanied by sheets of hail, which caused the mountain to run wild, torrents of water cascading down its slopes in every direction, and rockfalls, loosened by the water, crashing on all sides; on the second occasion, a fierce electrical storm encircled

Summit of Pass      Dutch Creek      Tornado Mt.



TORNADO PASS (7096 ft.)—Looking North  
Showing Southern Approach

the summit and severe shocks were felt by the members of the party. For days at a time dark thunder clouds, rent by vivid flashes of lightning, were seen to gather around the summit, and similar storms were encountered while on other adjacent heights.

On the Alberta side, the water flows by way of Dutch Creek to Oldman River and, on the British Columbia side, by Tornado Creek, a tributary of Line Creek, to Elk River. The name of Tornado Creek was conferred by the Commission. This stream flows north for half a mile and then circles around until its course is west-southwest through the narrow gap of the pass that has been cut in the range. The range may be said to be here divided into two parts, the one to the north continuing southeast for about six miles to the southern extremity of the peak that has been named Gould Dome and overlapping the southern part from which it is separated by the valley of the pass.

The approach by way of Dutch Creek is gradual and there is no sharp ascent to the summit; on the north side, while there is a considerable hill, the ascent is fairly easy and obstacles to the construction of a good road are few and can be readily overcome.

*Boundary Line.*—The characteristic letter of the pass is K. Concrete Monument, 1 K, was erected in a little grassy opening at the summit and two other concrete monuments were built, one on either side. Monument 2 K was erected on the east side of 1 K and the last straight-line course in this direction extends from Monument 2 K to Brass Bolt and Cairn 4 K; when it is stated that the angle of elevation read at 2 K on 4 K was  $49^{\circ} 43'$ , although

Bolt 7 K

Valley of Tornado Creek

Bolt 4 K Tornado Mt.



SUMMIT OF TORNADO PASS (7096 ft.)—Looking Northwest  
Showing sharp turn of Pass to West

2 K is some considerable distance from the base of the cliff, and that 4 K is 2120 feet above 2 K, some idea will be gained of the tremendous character of the intervening precipices. Brass Bolt and Cairn 4 K were set on a ledge of the central buttress of the west face of Tornado Mt.; from 4 K the watershed line climbs to the north corner of the mountain's crest, but does not reach the actual summit and, at a point some 200 feet below it, turns northward along the main crest of the range.

On the west side of 1 K, Monument 3 K was erected and the last straight-line course in this direction extends from 3 K to Brass Bolt and Cairn 5 K, set on the north ridge of the western peak, which is here very narrow. From this point, the watershed line climbs the said ridge to the summit of the peak, where Brass Bolt and Cairn 7 K are placed. The total length of straight-line boundary surveyed in Tornado Pass is 90.52 chains.

Camera and transit stations were occupied by the Topographical division at 2 K, 4 K, 3 K, 5 K and 7 K; also on the summit ridge of Mt. Erris, altitude 9296 ft., of Tornado Mt., 10,169 ft., and at Gould Dome North Station, 8950 feet, which last is on the summit of an outlying peak of the mass of Gould Dome, 540 feet lower in altitude and situated very nearly midway between that mountain and Tornado Mt. Between Gould Dome North Peak and Tornado Mt. is another elevation, 8500 feet in altitude, which is isolated on both sides by a dip in the connecting ridge, that on the north being some 400 feet lower and that on the south 500 lower than its summit. The run-off from the deeply indented cirque enclosed by Gould Dome, Gould Dome North, this central elevation and Tornado Mt. flows northeasterly to Hidden Creek, a tributary of Oldman River.

Views of the monuments and cairns, as well as descriptions of the brass bolts and a table of latitudes and departures referring them to the nearest concrete monuments, will be found at the end of the report. For the position and altitudes of monuments and bolts and for other information see Atlas, map sheets, Nos. 5A, 5 and 6.

*Tie with Land Surveys.*—A joint triangulation survey was made by the two divisions to connect the surveys of the boundary in Tornado and North Fork Passes with the northeast corner of Section 24, Township 11, Range 5, west of the 5th Meridian, the two surveys being closely connected by the same triangulation.

#### NORTH FORK PASS TO TORNADO PASS

Between Brass Bolt and Cairn 6 L, at the northern extremity of North Fork Pass survey and Brass Bolt and Cairn 7 K, at the western extremity of Tornado Pass survey, the watershed lies along the crest of a sharp ridge trending very slightly east of north. This ridge is the western wall of Tornado Pass and shows, facing it, a line of precipitous cliffs of striking alcove formation, rising abruptly above steep slopes of scree formed at the base of the cliffs by disintegration of the rock above. At one spot, a great mass of the overhanging cliffs has broken away and a tremendous rockfall has swept clear across the valley of Dutch Creek, only stopping its impetuous descent when well up on the opposite slopes. Huge blocks, weighing hundreds of tons, lie here on top of one another in the wildest confusion. The ridge extends for more than a mile north of 7 K to the gap of Tornado Pass, and four points of high elevation rise at intervals above its general altitude; of these points, Brass Bolt and Cairn, 6 L, is on the most southern, and the most northern is the pivot peak around which Tornado Creek circles from a north course to a west-southwest one. The points are at the eastern ends of four other ridges extending at right angles to the main ridge and containing the drainage of three valley troughs from which the southern and middle streams flow to Line Creek, and the northern to Tornado Creek.

"Midway" camera station, 8304 ft. is on a high point of the second ridge north of North Fork Pass and overlooks the valley of Line Creek. Two other camera stations were occupied on a comparatively low, curving sandstone hill, devoid of timber, in the centre of the inner trough between the High Rock Range and the Wi-suk-i-tshak Range, and were recorded as Horseshoe No. 1, 7080 ft. and Horseshoe No. 2, 7054 ft. (See Atlas, map sheet, No. 5). There are a number of ridges of similar low hills running up the centre of this inner trough, north of the main flow of Line Creek, where the course of that stream turns westward.

#### GENERAL REMARKS ON NORTH FORK AND TORNADO PASSES

At North Fork and Tornado Passes, the possible route of travel for pack horses, previously referred to as following the eastern base of the High Rock Range northward from Crowsnest Pass, crosses to the west side of the range and continues up the main stream of Line Creek. By descending the Dutch Creek trail for about six miles from where the Racehorse Creek trail joins it, a trail branching to the north is met and leads up a valley between the hills to connect with the wagon road, and later a trail, up Oldman River; this trail appears to terminate in the basin where the waters of Oldman River have their rise.

All the lower portions of the valleys of the hilly tract between the Livingstone and High Rock Ranges are fairly well timbered, particularly so in the valleys opening from the High Rock Range, but many grassy and bare openings are seen on the southern slopes of the lower hills and in the valleys between them. West of the watershed, the valleys and slopes are, for the most part sparsely timbered; patches of green timber are seen in the hollows here and there, but much of the area is open, where forest fires have done their work, leaving only a litter of brûlé and windfall and a scattering of small second growth to tell of the dense forest that once covered the entire area.

Mountain goats were seen frequently on the high peaks and ridges in the vicinity of North Fork and Tornado Passes, and the shale slopes are intersected in many directions by their paths of travel. There are many signs of deer and bears in the woods, and in the immediate neighborhood of Tornado Mt. and Gould Dome, a number of mountain sheep, the Bighorn (*Ovis Montana*), were seen; these last keep almost entirely on the east side of the High Rock Range and may frequently be seen on the grassy and shale slopes of the high hills of the cretaceous area between it and the Livingstone Range.

#### TORNADO PASS TO FORDING RIVER PASS

Beyond Tornado Pass, the watershed continues northwestward along the crest of the High Rock Range. The summit of Fording River Pass is nearly twenty-five miles north-northwest of the summit of Tornado Pass in direct distance; the watershed line between is very sinuous and, by way of it,

the distance is from six to ten miles longer. The portion of the High Rock Range between the passes named, in general, presents a sharply serrated outline, much broken in contour. As a rule the peaks rising from the main crest are pyramidal in form, when viewed from points at right angles to the range; looking in the direction of the crest they present elongated ridges, projecting on either side for a considerable distance in a more or less curved formation. In such manner, they divide the area immediately adjacent to the watershed ridge into irregular cirques or combinations of cirques, which collect the run-off within their surface areas and form streams flowing outward as tributaries to the main streams in the valleys parallel to the trend of the range.

From Tornado Pass summit the watershed line twists and turns erratically, on a generally direct course, almost due north for six and a half miles to the summit of a peak of 8500 feet altitude, about a mile west of Mr. Bridgland's Boundary No. 1 Station on Beehive Mt. In doing so it passes over eight high peaks; of these, Tornado Mt., 10,169 ft. is the highest, and the others range from 9200 ft. to 9800 ft.; two in particular, situated about five miles north of the pass summit, are of striking turret formation, rising abruptly from the main ridge. In this stretch of the watershed the portions of the main ridge between the peaks present shallow, saddle-like dips, rising and falling in long slopes; they are narrow and, in some cases, are what is called "knife-edge ridges." Quantities of limestone scree cover these ridges and the higher parts of the western slopes, which are generally steep and show many precipices; on the Alberta side, the watershed ridge presents a precipitous escarpment at the heads of the cirques between the outlying ridges. Very little permanent snow is seen and the range appears, during the summer months, as a serried array of grey limestone peaks.

From the end of this first course of six and a half miles, the direction is very nearly northwest for four and a half miles. The watershed line is less sinuous and three peaks, varying from 9000 to 9600 ft., are passed over; of these, the peak shown as Mt. Lyall, 9680 ft. on the map of Mr. Bridgland's previous survey is the highest. This course of the watershed ends in a peak of over 9400 feet.

The watershed now assumes a generally north direction, which it continues for some five miles and then, turning a little west of north, it zig-zags along the crest of the range for seven and a half miles farther to the camera station shown on the map of the survey (Sheet No. 7) as Baril Peak. It here turns nearly west for a little more than a mile to Mt. Cornwell from which it descends northwesterly, one and a quarter miles, to the lowest summit of Fording River Pass. In this last thirteen miles, the mountain contours, seen from the west, appear much more sharply accentuated and the forms, whether conical or pyramidal, more pronounced; the peaks above 9000 ft. are more numerous, the gaps between them more distinctly V-shaped and the connecting ridges of sharp rock instead of saddles covered by shale; the

projecting spurs and ridges are more ragged and severe, and the heads of the cirques between them walled in by precipices and very steep slopes of rock. On the eastern side of the watershed, the contrary is the case: the central ridge and peaks show a bold, rock escarpment, falling directly to low rounded ridges and hills, covered by a dense growth of green timber.

Directly south of Fording River Pass, a spur of the main range is separated from it by the northern branch of Henretta Creek, which heads in a cirque contained by Mt. Courcelette, and the peaks on which Mt. Cornwell and Baril Peak are set. The highest peak of this spur is a station of the Geological survey triangulation, which has been named Mt. Courcelette, it is the next highest peak to Tornado Mt. of the High Rock Range and has an altitude of 9977 feet above sea-level.

A ridge of lower hills of cretaceous formation has been referred to previously as extending northward up the Line Creek basin. This ridge of hills—perhaps, series of ridges would be a better term—forms the western boundary of Ewin Creek Valley, which, separated by a low divide, continues northward the valley of Line Creek. The hills along the east side of this valley are outliers from the main range and are more or less directly connected with it. Ewin Creek cuts through the western group of hills and joins Fording River a short distance above where it passes through the gap between the north end of Wi-suk-i-tshak Range and the lower cretaceous hills that continue the elevation of that range northward and which are shown on Dr. Dawson's map as "Green Hills"; these latter form the divide between the valley of Elk River and the valley of Fording River which, together, form the great Elk River Trough.

A number of good-sized streams, flowing from the cirques of the main range have cut deep valleys through the lower hilly ridges that border Fording River on the east, noticeably, Ewin Creek, Todhunter Creek, Chauncey Creek, Kilmarnock Creek and Henretta Creek. These streams have many branches near their heads, which are so disposed as to form still another minor trough between the lower ridge of hills referred to, and the main range, irregular and disconnected, but quite perceptible. In the case of Todhunter, Chauncey, Kilmarnock and Henretta Creeks there are, at their heads, lower and broader saddles on the watershed, which may possibly afford crossings of the continental divide, but they could not be referred to as passes. Faint trails, overgrown and obstructed by windfall, are to be seen up the valleys of these streams, but they do not appear to have been much used.

Fording River winds in a beautiful valley with a level floor from a half to a mile wide. There are many open meadow-lands in it, separated by belts and patches of green pine, spruce and fir; the lower part of the valley is most densely timbered but, unfortunately, a lot of the timber has been burned, these burned tracts extending up the valleys of tributary streams well to their heads and offering serious obstacles to travel in the shape of dense windfall. The meadows become more numerous and extensive as the valley is ascended; in some the

grass is more than knee high and affords most excellent feed for stock; in others the ground is of a marshy nature and especially so along the borders of the river.

Opposite the junction of Kilmarnock Creek with Fording River, the ridge of hills between the valley of the latter and Elk River Valley falls to a low level and continues so for several miles before rising to a similar ridge of hills farther north. Near the mouth of Henretta Creek, a trail branches from the Fording River trail and leads across this low depression to the Elk Valley Road.

Fording River now passes through a narrow gap in the northerly group of hills, where there are some log buildings that have been used in connection with coal prospecting; they are looked after by a caretaker who has charge of them and of similar buildings in other locations. Some six miles farther, the stream branches, one branch flowing from Fording River Pass and the other, through a narrow little canyon, from a divide between it and a branch of Aldridge Creek, also a tributary of Elk River. A trail, somewhat faint leads through the little canyon to a meadow above it, where a branch trail diverges and leads to Fording River Pass, the other going on, for the most part in the open to the Aldridge Creek divide.

On the Alberta side of the watershed are low, rounded and gently sloping hills, leading right up to the abrupt escarpment of the High Rock Range; they are densely timbered on the north and east slopes, but present openings on some of their southern and western faces. This area is drained by the headwaters of Oldman River; its north boundary is the divide between the waters draining to Oldman and Highwood Rivers, and is also the north boundary of the Crowsnest Forest.

A trail leads up Oldman River to its junction with Oyster Creek, one of its highest tributaries, and then up the latter and across the divide to the valley of Cataract River, but the main line of travel is by road and trail up Livingstone River over Sentinel Mt. Pass to the valley of Highwood River.

The following camera and transit stations were occupied in connection with the portion of the watershed above described, viz:—Tornado Creek North, 8738 ft., Ewin Pass, 8454 ft., Ewin Creek East, 8703 ft., Todhunter, 7777 ft., Fording River West, 7033 ft., Chauncey North, 8080 ft., Chauncey South, 7765 ft., Cone Hill, 8048 ft., Meadow Signal, 5214 ft., Kilmarnock, 8091 ft., Henretta, 8211 ft., Mt. Tuxford, 8365 ft., Fording River Pass West, 8125 ft., Spinster No. 1, 7535 ft., and No. 2, 7570 ft. For topography along the watershed and other information see Atlas, map sheets, Nos. 6 and 7. Owing to the limitations of the map, a number of the stations enumerated above fall without its scope.

#### FORDING RIVER PASS

This pass is a narrow crossing of the continental watershed, at an altitude of 7544 feet above sea-level. It has been named Fording River Pass by the Commission because it lies at the head of the eastern source of Fording

River. The trail above referred to as leading over the pass is little better than a line of blazes following the most accessible route, which is very rough and much obstructed by windfall until near timberline. A first summit is crossed in open alpine country and the trail descends to the valley of a branch of Aldridge Creek, passing a charming lakelet; it then ascends to the actual summit of the pass. On the opposite side the trail descends, for some distance, the valley of the stream heading from the pass and, winding along the hills to the north, eventually joins a wagon road up the valley of Highwood River; on this side it is much better marked as soon as timber is reached.

The pass summit is about half a mile wide at the bottom and about two miles wide from crest to crest. It is above timberline and has an uneven

Summit of Pass  
Aldridge Ck. Mt.  
Amphitheatre Courcelette Mt. Bolton



SUMMIT OF FORDING RIVER PASS (7544 ft.)  
Looking South

rock floor. Water flows eastward from it to Highwood River. There are several steep ascents in the approaches from both sides and it is not suited for a serviceable road, on which account no monument survey was made of it.

#### FORDING RIVER PASS TO ELK PASS

Directly south of the summit of Fording River Pass and immediately west of the watershed is a very interesting cirque, walled in by the precipitous cliffs of Mt. Cornwell peak and by the north extension of the Courcelette spur; it is the head of the southern source of Aldridge Creek and a very striking example of horizontal stratifications is here displayed (see illustration). North of the summit, the watershed line ascends to the top of a central isolated peak, shown on the map as Mt. Bolton, 8878 ft., and then falls north-eastward to a low dip, which might possibly furnish a more direct pass from the Elk Valley to the Highwood Valley than by the west source of

Fording River, but at present there is no trail leading to it up Aldridge Creek. Crossing this low dip, which is about the same altitude as the Fording River Pass summit, the watershed line ascends to Mt. Armstrong, 9161 ft.; beyond, the crest of the High Rock Range is much broken and several high peaks of castellated appearance stand out prominently. The watershed line is very erratic in this portion of its course, rising to high summits and descending to low saddles between them, at or near timberline; these saddles are easy of approach from the west, but a through passage is cut off by the precipitous escarpment on the eastern face of the range. In such fashion, the line loops from point to point around the middle and northern sources of Aldridge Creek until it comes to the Weary Creek Gap.

Mist Mt.

Elk River



ELK MTS. RIDGE—Looking East  
Lower Elk Lake, Source of Elk River

Weary Creek, like Aldridge Creek, has three main sources which, starting from the crest of the High Rock Range, join together and flow between two outlying timbered spurs enclosing the basin of its several sources; these spurs extend southward nearly parallel to the main range. The gap referred to is at the head of the southern source of the stream and would seem to furnish an easy crossing of the watershed to the Highwood River basin were it not that there is an escarpment of some 300 feet on the eastern side; the summit of the gap is below timberline and is quite open. A trail leads from the Elk Valley road up Weary Creek, but was not followed to its termination. Two camera stations were occupied on the southern of the two spurs. The gap is quite narrow and would be of little interest but for its being the division between the High Rock Range and the Elk Mountains, which latter form the northerly extension of the range; the difference in nomenclature first appears on Dr. G. M. Dawson's map of 1886 and has since been conformed to.

From Weary Creek Gap, the Elk Mountains extend northwest some twenty miles to the gap of Pocaterra Creek, which furnishes a route to the summit

of Highwood Pass; the divide separates the waters of Pocaterra Creek and Storm Creek, the latter being a tributary of Highwood River; both streams and the divide between them are on the Alberta side of the main watershed. The gap of Pocaterra Creek lies about five miles northwest of the point where the continental watershed turns west, at right angles to its previous course, and crosses the summit of Elk Pass.

The Elk Mountains ridge, from the Weary Creek Gap to the head of the north source of Weary Creek, is of very broken and irregular formation, resembling that on the south side of the gap, but it then becomes more regular and presents a straight wall along the east side of Elk River Valley; its crest is much serrated and a number of distinctly higher points rise at intervals.

High Rock Range



SHOWING TIMBERED RIDGES OF THE CRETACEOUS CROWSNEST TROUGH  
North of the Oldman—Highwood Divide

The western slopes descend with regularity and have been eroded in an endless number of steep, sharp-edged ridges, giving the impression, when seen from a distance, of a gigantic file.

The eastern face shows a bold precipitous escarpment sending out many auxiliary ridges of irregular form, separating the numerous cirques into which the watershed ridge, on this side, has been carved. All the area, bounded by the Oldman and Highwood Rivers Divide on the south, the High Rock Range and Elk Mountains on the west and the Misty and Highwood Ranges on the north and east, which still represents the Crowsnest cretaceous trough, is drained by Cataract and Highwood Rivers and their many tributary streams. It consists, in its southern portion, of well-wooded ridges and hills, presenting many open spaces on the south and west slopes and many patches of brûlé and windfall; as the north end of the trough is approached, the ridges and hills become higher and of rougher contour and are, for the most part, covered by brûlé, the green timber having nearly all been destroyed by forest fires. The trail down the valley of Cataract River joins a wagon road up

Highwood River, which ends at a logging camp. From this camp a trail continues up Storm Creek to its head and across the divide to Pocaterra Creek, which it follows to Lower Kananaskis Lake, thus keeping up a continuous route of travel all the way along the eastern base of the watershed

East Approach to Fording River Pass

Highwood River Valley



EASTERN ESCARPMENT OF HIGH ROCK RANGE

Hilly Cretaceous Area of Crowsnest Trough

range from the railway at Crowsnest. These trails are always much impeded by down timber, the result of windfall during the stormy parts of each year, and, in some cases, are almost effaced; still, they are the only present means of travel and, when cleared out, furnish feasible routes.

Elk Mts. Ridge      Storm Creek

Highwood Pass



EASTERN ESCARPMENT OF ELK MTS. RIDGE

Showing South Approach to Highwood Pass

On the British Columbia side of the watershed, a stream flows from the divide at the head of the north source of Fording River to Aldridge Creek and the Fording River trail follows it and the main stream to the Elk Valley Wagon Road. Three miles north, the road ends at the mouth of a tunnel driven into the hillside where considerable work has been done prospecting for coal. There are here several log buildings, known locally as Weary Creek Camp. A good trail continues up the valley from the end of the road, but it is a full mile before Weary Creek is reached.

The Elk Valley Road starts at Michel on the Canadian Pacific Railway through Crowsnest Pass and is a main line of travel, as travel is considered in mountain country; on this account a short description of the route as travelled by Mr. Cautley may not be amiss:—From Michel to the intersection of the Line Creek trail is seventeen miles, much of which passes through cultivated land, and there is good horse feed at the intersection; thence, it is six and a half miles to Dutch Charley's, where the road crosses the river from east to west, and nine miles farther, or fifteen and a half miles, to Round Prairie, a pretty meadow of seven or eight acres in extent. At Round Prairie the road again crosses the river, from west to east, by a bridge. Twelve and a half miles north of Round Prairie are some neatly built log houses, known locally as "C. P. R. Headquarters," the end of the telephone line from Michel. Eighteen miles from Round Prairie is Mosquito Flat, at which there is a well-finished log house belonging to some mining company; the flat, itself, is too small to afford good feed for horses but, by leaving the road a quarter of a mile south and striking through the timber towards the river, meadows of good grass may be reached. From Mosquito Flat, it is four miles to the crossing of Aldridge Creek, where there is another camp of the mining company, and three miles farther to Weary Creek Camp, where the mining company has started some permanent works, and excellent horse feed is found in the meadows along the river. The total distance from Michel to the end of the wagon road is estimated at fifty-eight miles. From Weary Creek Camp, it is ten and a half or eleven miles, by a good pack trail through heavy timber, to Riverside, which is another permanent camp of the mining company, and where there are large meadows along the valley bottom. From Riverside, it is ten and a half miles to yet another camp of the mining company, and at this point the trail turns from the river and, within a mile, crosses Canyon Creek and follows it to the summit of Elk Pass, about three miles farther on; from this last camp the pack trail is not nearly so well cut out and it is more difficult to travel. The Elk River is about half a mile west of the camp and, soon after, arrives at its source in two very picturesque lakes, which are fed by the glacial torrents of a large snow-bound basin in which they lie; they are more particularly described in Chapter VI.

The Elk River flows in a wide, straight valley, six or more miles from crest to crest, hemmed in on both sides, for the greater part of its length, by

high mountains, which increase in height and boldness of outline as the valley is ascended. In addition to the streams already referred to as being tributary to it from the High Rock Range on the east, there are many large streams from the mountain range on the west side of the Elk Valley Trough, which help to swell its volume. The valley contains much good timber, but there are many burnt tracts and brûlé and windfall are frequently encountered. From the mouth of Aldridge Creek to Riverside and for a few miles beyond, the valley, here about two miles wide, its narrowest part, is densely timbered with pine, spruce and fir, much of which has a good commercial value. The valley then broadens out and becomes more open along the bottom, showing wide stretches of marshy meadow-land, through which the river winds in great loops, mingled with picturesque groves of green timber, and the benches and mountain slopes are largely covered by brûlé and windfall. This class of country continues to the summit of Elk Pass, where there are considerable areas of green timber.

In order to cover the ground between Fording River Pass and Elk Pass, as well as a portion lying south of Fording River Pass, between it and the Highwood-Oldman Rivers divide, the following camera stations were occupied by the Topographical division, viz: East of the watershed, Mosquito Hill, 7067 ft., Green Ridge, 6675 ft., Coyote Hill, 6562 ft., Prairie Hill, 7334 ft., Grassy Hill, 6524 ft., Storm Creek No. 1, 8184 ft., No. 2, 8095 ft., Highwood Ridge South, 8395 ft. and Highwood Ridge North, 8885 ft.; along the watershed, Mt. Bolton, 8878 ft., Mt. Armstrong, 9161 ft., Mt. Odlum, 8966 ft. and Storelk, 9405 ft.; west of the watershed, Aldridge North, No. 1, 8727 ft., No. 2, 8614 ft., Weary Ridge South, 6960 ft., Weary Ridge North, 7304 ft., Riverside West, 7872 ft. and Cabin Hill, 7205 feet. All the foregoing except Mt. Bolton and Mt. Armstrong were occupied during July of 1916. Owing to the early snowfall of 1915, the section of country covered by these stations could not be surveyed, but the report upon it is embodied with that of 1915, in order to keep up the sequence of the survey between Crowsnest Pass and Elk Pass, most of which was done in that year. The limitations of the map do not permit of all the camera stations being shown; for such as come within its scope and for general topography along the watershed, see *Atlas, map sheets, Nos. 7, 8 and 9.*

#### ELK PASS

*History and Origin of Name.*—It would seem likely that such a broad and obvious route as the Elk River Valley, across the continental divide to Kananaskis Lakes and northward to the Bow River Valley, must have been well known to the Indian tribes and to the fur traders of early days, but the pass does not seem to have received any special name. Even as late as Dr. Dawson's report of his 1884 explorations, when he crossed it, no name had been given and no name for it appears upon his 1886 map, or upon any of the later map publications. It divides the head waters of the Elk and Kananaskis

Rivers and, seeing that there is another pass known as Kananaskis Pass, your Commissioners have in this report referred to it as Elk Pass.

*Topography and Characteristics.*—Elk Pass summit separates the waters flowing to the Pacific Ocean by way of Elk River from those flowing to the Arctic Ocean by way of Kananaskis River, a tributary of Bow River, which joins with Oldman River to form the South Saskatchewan.

The direction of the pass is northwest and southeast and its lowest summit lies at an altitude of 6205 feet above sea-level. It is of a somewhat peculiar formation and is divided into two passages by a low, heavily-timbered ridge. In reality it is a twin pass with two very distinct summits about one and a



ELK MTS. RIDGE AND SUMMIT OF ELK PASS  
Looking East

half miles apart, that to the east being 6445 ft. in altitude, or 240 feet higher than the other; the intervening hill reaches a maximum elevation of 450 feet above the lower summit. Both passages have muskeg bottoms and the whole pass, near the summit, is marshy between the low ridges by which it is intersected.

At the main or lower summit is a marshy meadow, over which it was necessary to cross-section and take levels before a point of commencement for the monument survey could be determined. The line of watershed crosses a number of wet muskegs between the respective summits and the containing slopes of the valley. The pass is thickly timbered east of the lower summit and in some places the timber is quite heavy, one spruce cut, measuring thirty-one inches across the butt; west of the same summit it is more sparsely timbered and throughout there are patches of brûlé and windfall mingled with the green timber.

Flowing from the two marshy summits referred to, Canyon Creek on the west and Tobermory Creek on the east are tributary sources of Elk River; the former soon leaves the marshy open and flows in a deep, picturesque canyon before reaching the comparatively open bottom land along the river; the latter flows in a broad, shallow trench of easy grade, covered by brûlé, and joins the main stream about half way between the pass summit and Riverside Camp.

On the Alberta side, two branches of Boulton Creek, from the respective summits of the pass, unite and flow to Lower Kananaskis Lake, which with Upper Kananaskis Lake, lying close by to the southwest of it, form the main source of the river of that name. The northern slopes leading to Kananaskis Lakes are rough and uneven, and are much cut up by intersecting valleys of streams tributary to Boulton Creek and by minor troughs and ravines between the ridges. For the most part they are covered by brûlé, windfall and second

Lower Elk Lake	Upper Elk Lake	Canyon Creek	Bolt 8 M	Summit of West Passage	East Passage	Upper Kananaskis Lake	Boulton Creek
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KANANASKIS RANGE AND SUMMIT OF ELK PASS  
Looking West

growth, and the sparsely scattered timber is chiefly pine and spruce of little commercial value; there are a few belts of larger green timber, but they are of small extent.

The pack trail, such as it is, follows the western passage across the summit; there is a faint indication of a pack trail leading over the Tobermory summit, but it has not been used for a long time. From the summit, to Lower Kananaskis Lake, the trail is poorly located, very narrow and much obstructed by windfall, but from the Lake, all the way to Morley on the main line of the Canadian Pacific Railway, there is a first-class pack trail, passing through miles of windfall, upon which a great deal of good work has been done. From the pass summit to the upper end of Lower Kananaskis Lake is about eight and a half miles; the trail here crosses the river connecting the two lakes at a somewhat deep ford, after which it follows the westerly shore of Lower Kananaskis Lake and crosses the south branch of Kananaskis River about half a mile below the lower end of the lake. From this ford the trail remains on the east side of the Kananaskis River all the way to Morley. From the ford

between the two lakes to Morley is about forty-nine miles and the whole distance from Elk Pass about fifty-seven miles.\*

Both approaches to the summit of the pass afford facilities for either a wagon road or a railway, and trial location lines of the Grain Belt Construction and Development Company's railway have been surveyed through both passages. Beyond the two summits of the pass, long timbered slopes rise to the high limestone peaks of the Elk Mountains on the east side and of the Kananaskis Range on the west side. The bottom and more level portion at the summit is approximately two miles wide, but more nearly three as the watershed winds; from crest to crest of the containing limestone ridges, the distance is approximately four and a half miles, as the crow flies.

*Boundary Line.*—Elk Pass is designated by the letter M. Concrete Monument 1 M is on a low knoll of dry ground a few chains west of the actual summit in the muskeg. On the west side, Monuments 2 M and 4 M were built, the last straight-line course in that direction lying between them. Beyond 4 M, a short traverse was made toward Brass Bolt and Cairn 6 M, in order to determine the location of the natural watershed over a pocket in the side of the mountain that was both timbered and broken, and therefore, obscure. Brass Bolt and Cairn 6 M is situated on the crest of a prominent, outstanding rocky point of the mountain side. From 6 M, the watershed line crosses a little grassy col and then climbs swiftly to the highest point of the peak dominating the pass on the west side; on this mountain summit, Brass Bolt and Cairn 8 M was placed in 1916 at an altitude of 9752 feet.

On the east side of Monument 1 M, Concrete Monuments 3 M, 5 M, 7 M, 9 M, 11 M, 13 M, 15 M, 17 M, 19 M and 21 M were erected. Of these, 15 M is on the highest point of the ridge between the two summits of the pass, and the eastern summit lies between 17 M and 19 M. Monument 21 M is nearly up to timberline on the slopes of the Elk Mountains and the last straight-line course in this direction extends from 21 M to Brass Bolt and Cairn 23 M, which is placed on a prominent rock point of the mountain side over which the watershed line passes. From 23 M the watershed line is a naturally defined boundary following the edge of the ridge to the crest of the Elk Mountains, where, on a prominent peak, Brass Bolt and Cairn 25 M was placed at an elevation of 9025 feet above sea-level; here the boundary turns southeast and is identical with the watershed line, following the crest of the Elk Mountains Ridge. In all, thirteen concrete monuments were erected and four brass bolts and cairns placed. The total length of straight-line boundary surveyed is 319.52 chains.

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\*There are three fords across the south branch of Kananaskis River in the three-quarters of a mile of its length between the lower end of the lake and its confluence with the north branch. The upper ford is about a quarter of a mile below the outlet of the lake at a point where the stream is broad and the current not very swift, and this ford is safe at all stages of the water. The main trail crosses about half a mile below the outlet of the lake, and the third ford is just above the confluence of the two branches; both these fords are safe at ordinary stages of the water, but are dangerous when the water is high owing to the depth and speed of the current.

For this part of the work, camera and transit trations were occupied by the Topographical division at Monument 1 M and at Bolts 6 M, 8 M, 23 M, and 25 M; the following additional stations were also occupied: Mt. Tyrwhitt, 9428 ft., Highwood Pass West, 9591 ft., Frozen Lake, 7746 ft., Kananaskis Lake South, 8418 ft. and Elk Lake North, 9552 feet.

At the end of the report will be found views of the concrete monuments and cairns over brass bolts that have been erected, also descriptions of the positions of the brass bolts placed and a table of latitudes and departures referring them to the nearest concrete monument. For positions and altitudes of monuments and bolts, as well as for general topography along the watershed and other information, see *Atlas, map sheets, Nos. 9 and 9A.*

*Tie with Land Surveys.*—Direct connection was made with the northeast corner of Section 6, Township 19, Range 8, west of the Fifth meridian, the east boundary of which had been surveyed across the watershed into British Columbia. Direct connection was also made with the surveys of Mineral Lots 8490, 8491, 8492 and 8493 of British Columbia, all of which are surveyed in such a way as to be partly in Alberta. Lots 8492 and 8493 in particular have practically the whole of their respective east and west boundaries in Alberta, and it is difficult to understand how these surveys came to be carried so far, and so palpably, over the watershed, since the boundaries named cross creeks that are plainly flowing in Alberta, and descend, on the Alberta side some hundreds of feet below the summit of the pass.

#### GENERAL REMARKS ON THE COUNTRY ADJOINING THE SEASON'S SURVEYS

The cretaceous areas of the Crowsnest and Elk River Troughs are underlain by extensive beds of bituminous coal on each side of the section of the continental watershed between Crowsnest and Elk Passes, described in this Chapter, and much prospecting has been done with abundant results; but, at present, owing probably to lack of facilities for transport, no mines are in operation at a distance from railway traffic. Frequent outcrops of coal are to be seen on many hills and ridges, and were especially noticed on both branches of Alexander Creek, near their heads, where buildings have been erected and tunnels driven into the hillsides. The hills on the west side of the Line Creek and Ewin Creek divide show beds of coal, and a number of tunnels have been driven in near the mouth of Ewin Creek, where also there are log buildings; again, on Fording River, above the junction of Henretta Creek, are prospects and buildings; more tunnels have been driven near the mouth of Aldridge Creek, and extensive buildings have been erected there. All these buildings are of good solid construction and seem to have been built to accommodate a large number of men, and the tunnels have good sized coal dumps in front of them and appear to be driven in for a considerable distance. The camps along the Elk Valley, which are connected with similar prospects, have been referred to as being of a good permanent nature, and the general impression derived

is that all these coal locations would be developed to the operating point if there were railway facilities to convey the output to a market. Preliminary surveys for a railway have been made by the Grain Belt Construction and Development Company from Calgary to Fernie by way of Elk Pass and Valley, on the British Columbia side of the watershed, but there it rests for the time being.

The timber has already been referred to in a general way. On the Alberta side of the watershed, the prevailing species are pine, *Pinus Murrayana*, at lower altitudes, and higher up, spruce, *Picea Ingelmanni*, balsam, *Abies sub-alpina* and, last of all, larch, *Larix Lyallii*; in the lower valleys, on the bottom-lands along the streams, poplar, *Populus tremuloides*, of small size is often seen. The same species, with the exception of the poplar, occur on the British Columbia side and, in addition, the Douglas fir, *Pseudotsuga Douglassii*; at lower altitudes spruce, *Picea Canadensis* (Albertina) and larch, *Larix occidentalis*, the latter in restricted quantities, are seen. The pine, spruce, lower larch and fir are of sufficiently advanced growth to be of good commercial value; unfortunately, large tracts have been burned by forest fires, but there is sufficient left to supply all industrial developments for a long time, and Nature is gradually reforesting the burned areas.

The country abounds in game; Rocky Mountain goats are on all the high peaks; mountain sheep, the Bighorn, were seen on the Erickson Ridge, west of the continental divide, and at Tornado Mt. on the east side, and can doubtless be found in many other places in the vicinity; red deer, black and white tail, are in all the woods and on the slopes, high up. In the Fording River Valley and tributary valleys, elk are very numerous and many, singly and in herds, were seen; their trails are everywhere there. Bears were not often seen, but when snow fell, their presence was apparent by their tracks. Fresh beaver-cutting was noted in the Elk Valley. Rabbits and small, fur-bearing mammals were not often seen, but the first snowfall showed them to be plentiful. Throughout, woodland grouse of several species were much in evidence and, high up near the snow, ptarmigan were frequently met with. There are a few trout in the Elk River, but they are not plentiful; on the eastern side of the watershed, in the Livingstone and Oldman Rivers, and their tributaries, they may be caught in quantities, but are of a different species.

#### MAPS

In preparing the maps of the continental watershed and vicinity dealt with in this Chapter, the maps made by Mr. M. P. Bridgland, D.L.S. of the Crowsnest Forest were used. These maps cover fully the area lying between the crests of the High Rock and Livingstone Ranges, and bounded on the north by the divide between the sources of the Oldman and Highwood Rivers. The Commissioners desire to tender their grateful acknowledgements to Mr. Bridgland for the very adequate assistance supplied them by the said maps.

## CHAPTER VI

### SURVEYS EXECUTED IN 1916

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#### DESCRIPTION OF OPERATIONS

Mr. R. W. Cautley assembled his party at Morley on the 5th June, 1916, and proceeded to Kananaskis Lakes by the Kananaskis River trail, arriving at the ford between the Upper and Lower Lakes on the 10th June.

Owing to the extraordinary amount of snow which fell in the mountains during the winter of 1915-16 and the lateness of the summer season it was found that all trails beyond, or higher than, the Lakes were still blocked by deep snow. Thus, Mr. Wheeler, who had arranged to come in from Banff over the Mud Lake Pass trail, only succeeded in reaching Kananaskis Lakes on the 21st June by dint of opening up the trail over the pass with snow-shovels.

On the 12th June the weather turned suddenly warm, and from the 15th June to the 15th July all rivers and larger creeks were dangerously high and overflowed their banks in many places. During this period, on the 22nd June, Mr. Cautley was unfortunate enough to lose his head packer by drowning in the Kananaskis River. The accident took place twenty miles from his main camp on the Lower Lake while the packer was attempting to rescue a pack-horse which had fallen off the trail and swum over to the other side of the river. Jacob Koller was a fine young farmer from Dowling Lake, Alberta, who had been a member of Mr. Cautley's party since the inception of the work in 1913, and his loss was deeply felt by the whole party.

The work which the Commission desired to accomplish during the season of 1916 was to complete the survey of that section of the boundary between the point to the south of Elk Pass reached by Mr. Wheeler's division in 1915 and a point in the vicinity of Assiniboine Pass to which the work had been carried in 1913, thus completing the survey of the boundary from the International Boundary to the main line of the Canadian Pacific Railway through Kicking Horse Pass. Of this section the Commission had already completed the monument survey of Elk Pass and the only remaining passes of sufficient importance to demand special investigation were, in order northerly, Kananaskis, Palliser, White Man and Assiniboine.

Several efforts were made to reach the summit of Kananaskis Pass in June, but were unsuccessful on account of the deep snow, and it was only on

the 4th July that Mr. Cautley was able to make it on snowshoes\*. It was found to be a narrow gap between the peaks lying above the timberline at an altitude of 7682 feet above sea-level, as subsequently determined by the Topographical division. The approaches on both sides are very steep and it was considered that there would be no adequate advantage to repay the cost of a monument survey which, consequently, was not made.

Mr. Cautley's party started on the 5th July for White Man Pass. From the fork of Kananaskis River, which is about three-quarters of a mile below the end of the Lower Lake, to the Spray River Ford is about twenty-three miles by way of the north branch of Kananaskis River, Mud Lake Pass and



SPRAY RIVER FORD  
on 7th July, 1916

a tributary of Spray River. This part of the trail is not very much travelled and is marshy on the Spray River side of the pass. Spray River Ford is about thirty miles from Banff and is the only place where it is necessary to ford the river. On the 7th July, Spray River was very high and the ford was dangerous; fortunately there is a stream measurement cable and car just above the ford and it was found possible to ferry men and supplies across on it. At any normal stage of the water the ford is quite safe.

\*As an explanation of the very high water in the lakes and rivers during the latter half of June and the first half of July it is interesting to note that Mr. Cautley found from three to fifteen feet of snow on the 4th July over the last four miles of the trail to Kananaskis Pass—i.e., at all altitudes over 6000 feet above sea-level—whereas Mr. MacDonald of the Geological Survey was able to get over the pass with horses on the 18th July.

From the ford the trail follows the left bank up stream for four and a half miles to the fork of the Spray, of which the northern stream is known as Bryant Creek and has its source near Assiniboine Pass; the southern stream continues as Spray River to its main source at Palliser Pass. After crossing Bryant Creek, immediately above its confluence with the Spray, the trail continues to follow the left bank of the latter for about two and a half miles to where it branches, the trail to Palliser Pass crossing the Spray River and thence forward following the right bank most of the way to the summit of the pass, which is about fourteen miles altogether from Bryant Creek ford; the other branch of the trail leads in a southwesterly direction and follows



STREAM MEASUREMENT CABLE  
by which Mr. Cautley crossed with his outfit

the left bank of White Man Creek to the summit of White Man Pass, a distance of about seven miles from the Bryant Creek Ford.

Mr. Cautley's division reached White Man Pass on the 8th July and completed the monument survey on the 24th. A move was then made to Palliser Pass where the division arrived on the 25th July and completed the monument survey there on the 11th of August.

On the 7th and 8th of August the Commissioners visited the summit of Assiniboine Pass, distant about twenty-five miles by trail from the summit of Palliser Pass, and, having examined the same, found it would be necessary to make a monument survey; therefore, at the close of the work at Palliser Pass, Mr. Cautley moved his party to the Assiniboine Pass summit, arriving

there on the 15th of August, after spending a day and a half cutting his way through much fallen timber on the Bryant Creek trail.

Several snow-storms occurred while the division was at work at Assiniboine Pass, of which the greatest happened on the 17th and 18th of August, when twenty inches of snow was measured. Work was completed on the 15th September and the party proceeded to Banff, where all, with one exception, were paid off on the 19th September.

In accordance with the plans of the Commission, Mr. Cautley then proceeded with one man and six horses to make an examination of Howse Pass, with a view to ascertaining the best means of getting there with supplies. He reached Howse Pass on the 26th September, via Lake Louise, Bow Pass, Mistaya River and the south branch of the North Saskatchewan River.

From Lake Louise Station, which is the nearest point of railway communication by the foregoing route, it is seventy miles to Howse Pass. The trail is good as far as the mouth of Mistaya River, but the crossing of that stream would be a difficult matter in June and would, in any case, involve the use of a boat or the making of a raft. There is no trail, properly speaking, up the south branch of the North Saskatchewan River, which has a gravel bed about a quarter of a mile wide, with numerous water-channels and high rough banks; in September it is easy to take horses up the bed of the river, crossing and recrossing the various water-channels, but in June this would be impossible owing to high water and it would be necessary to locate and cut out from ten to fourteen miles of a somewhat difficult trail.

Mr. Cautley returned to the railway at Field, B.C. by way of Blaeberry River, Amiskwi Pass and the Amiskwi River trail. By that route the distance to be travelled from Field to Howse Pass is about forty-four miles and, although that part of the trail from Amiskwi Pass to Blaeberry River is very high and involves a great deal of climbing, it was found practicable for pack horses.

Mr. Cautley reports that the Howse Pass is a low, timbered pass and that the altitude of 4,800 feet above sea-level given for it on existing maps is not far from correct; also that the straight-line boundary to be surveyed will probably extend for one and a half miles and necessitate the construction of six or seven concrete monuments.

The Topographical division started from Banff on the 5th June and travelling by the Spray Lakes trail, Mud Lake Pass and north branch of the Kananaskis River arrived at the ford between Upper and Lower Kananaskis Lakes on the 23rd June. In the interval much time had been spent digging out the trail over Mud Lake Pass, which was buried in snow to a depth of five feet in places.

On June 24th Interlakes Camera Station, between the Kananaskis Lakes on the west side, was occupied while some of the party assisted Mr. Cautley's men at the place where his packer was drowned.

On June 27th, the division moved across Elk Pass and was engaged until July 4th surveying the watershed in the vicinity of the Elk Lakes. Work was then carried down Elk Valley to connect with the survey where it had been closed the previous year at Aldridge Creek.

Crossing Fording River Pass, the watershed and vicinity were surveyed, by a party under A. J. Campbell, D.L.S., south to the Highwood-Oldman Divide and north to the summit of Highwood Pass, an Alberta watershed separating the waters of Storm and Pocaterra Creeks. A return was then made over Highwood Pass to Kananaskis Lakes and so to Elk Pass where, on the 31st July, Brass Bolt and Cairn No. 8 M was placed on the summit of the high peak dominating Elk Pass on the west side, which could not be placed the previous season owing to the heavy snowfall in September.

A full report dealing with the portion of the watershed surveyed south of Elk Pass will be found in Chapter V, where it has been embodied in order of sequence of the work.

The survey was now carried up the branch of Kananaskis River flowing into Upper Kananaskis Lake. About three miles beyond the lake the stream forks, each branch flowing from a pass over the continental divide. The main trail follows the northerly branch and leads to the summit of the pass shown on existing maps as Kananaskis Pass. The two passes are here referred to respectively as North and South Kananaskis Passes.

Two parties were at work in these two passes and their vicinity from the 10th until the 22nd of August. On the 23rd August the parties joined in Palliser River Valley on the west side of the watershed and, on the 24th, moved about five miles up the stream to the summit of Palliser Pass.

Work was completed at Palliser Pass on the 27th August and a survey was then made of Spray Pass, situated three miles north of Palliser Pass; it was continued northerly along the watershed to the summit of White Man Pass, less than four miles distant, where the party arrived on the 2nd of September and closed work in that vicinity on the 8th.

Two stations were now occupied in Bryant Creek Valley and, on the 13th September, the division joined Mr. Cautley's division at Assiniboine Pass.

In 1913 the Topographical survey of the watershed had been carried south from Simpson Pass to Mt. Assiniboine, described in Chapter III of this report, and it only remained to occupy a few additional stations in Mitchell River Valley, which circles Mt. Assiniboine on the north and west; this was done between the 14th and 18th September. The 20th and 21st September were spent placing brass bolts and erecting cairns, and in taking some photographs of the pass and surroundings.

On the 22nd September the division started for Banff by the Bryant Creek and Spray Lakes trail, a party making a flying trip to the Mud Lake Pass, where a final station was occupied on the 23rd of September. From the 13th until the 23rd had been bright, glorious weather, which enabled the work for

the season to be closed up most satisfactorily. On the 25th September the parties of the Topographical division were paid off at Banff.

#### ELK PASS TO SOUTH KANANASKIS PASS

From Brass Bolt and Cairn 8 M at the western extremity of the Elk Pass monument survey, altitude 9752 feet above sea-level, the watershed line travels practically due west for nearly two miles to the summit of a bold,



UPPER ELK LAKE

snow-crowned peak of 10,430 feet altitude. At this pivot it swings southwest, gradually curving towards the south, over a course of about three and a quarter miles to another high, glacier-hung peak of 10,400 feet, rising directly north of a broad glacier which surrounds it on two sides and has its source at the eastern base of Mt. Joffre. The course between the last mentioned peak and Mt. Joffre is again southwest and the distance about two miles following the watershed.

Mt. Joffre is the supreme massif of the region: it rises to an elevation of 11,316 feet above sea-level and has been so named by the Commission in honor of the great Field Marshal of France. Seen from the north and west it appears an isolated snow-peak and is surrounded on three sides, north, east and south-east by icefields and glaciers; towards the west it presents towering rock

precipices. It dominates the wild, glacial amphitheatre to the east of it in which the Elk River has its farthest source and the outflow from the many glaciers surrounding the amphitheatre furnish the waters of that stream. Three miles down its valley is the head of Upper Elk Lake, a very picturesque sheet of water, one and a quarter miles long by a third of a mile wide; half a mile beyond the lake is Lower Elk Lake, also very picturesque, with a greatest width of half a mile.

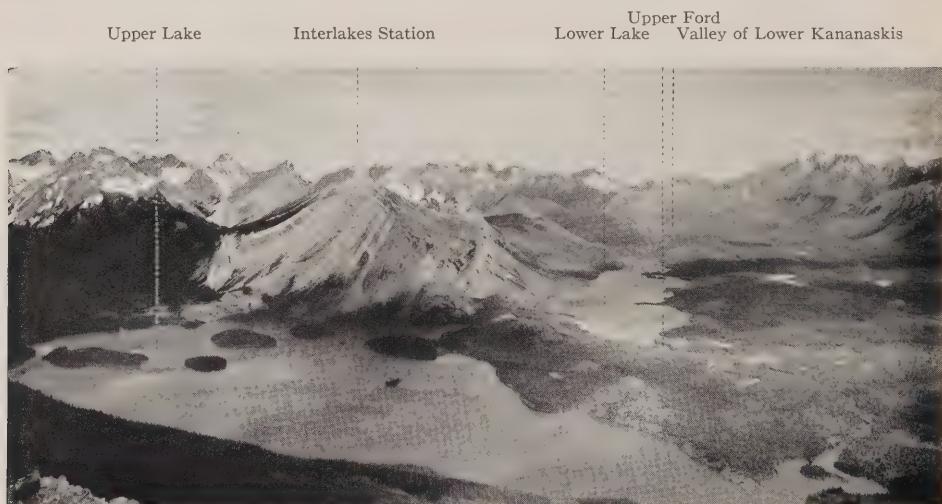


LOWER ELK LAKE

Two and a half miles north of the above described portion of the watershed, in a valley surrounded by towering peaks, lies Upper Kananaskis Lake, a large sheet of deep-blue water of irregular shape, dotted with heavily-timbered islands; its greatest length is two and a half miles and greatest width one and three-quarter miles. The Upper Kananaskis River, flowing from the passes of the same name, enters the lake at the southwestern corner; the exit from the southeastern corner flows north for a mile and a half to the ford where the combined trail from Elk and Highwood Passes crosses it; this crossing may be said to be at the south end of Lower Kananaskis Lake, which extends northward for about three and a half miles, and is in places a mile wide.

Half a mile north of the ford the trail to the Kananaskis Passes branches from the trail along the west shore of the Lower Lake and, crossing a narrow neck of land between the two lakes, within half a mile meets the Upper Lake, which it skirts close along its north shore; it then travels over a ridge and at a mile from the lake crosses the Upper Kananaskis River, and keeps near the bed of the same to the fork, about two miles farther on, at the junction of the streams flowing from North and South Kananaskis Passes.

Southwest of Upper Kananaskis Lake about half a mile and 100 feet above it is a little lake, three-quarters of a mile long by a quarter of a mile wide, nestling snugly in a timbered pocket of the valley of a large stream fed by outflow from glaciers on the north and northeast slopes of Mt. Joffre.



THE KANANASKIS LAKES

On the south and southeast side of the same mountain are the headwaters of White River, a tributary of the Kootenay River, which flow from a deep, densely-timbered amphitheatre and a large glacier.

Within the above described area of high mountains, wide glaciers and deep forested valleys, bounded by Elk Pass and River, Mt. Joffre and its flanking icefields and the Upper Kananaskis River and Lake, are many striking peaks, five of which are over 10,000 feet and two over 9,900 feet in altitude; they are all dominated by the great peak named Mt. Joffre and have been given the names of distinguished generals who have rendered such names immortal through their splendid services to France in the great world war now in progress. (See Atlas sheet No. 9).

At Mt. Joffre the watershed line changes its course abruptly from south west to north-northwest and follows the edge of Mangin Glacier and its western ramifications for six miles to Three Isle Lake South Camera Station. On the

southwestern side of this great body of ice, surrounding Mt. Joffre on the north and northwest, precipices and steep jagged ridges fall very abruptly to the valley of a stream flowing to Palliser River, which it joins after a run of some seven or eight miles from a divide between it and the waters of White River, already referred to; the general course of the stream is northwesterly but, just below Three Isle Lake South Station, it bends southerly on a half circle and soon joins the Palliser River, about eight miles below the point where the stream from North Kananaskis Pass joins it; it has been named

Valley of South Pass	Fork of Upper Kananaskis	Valley of North Pass	Trail along North Shore
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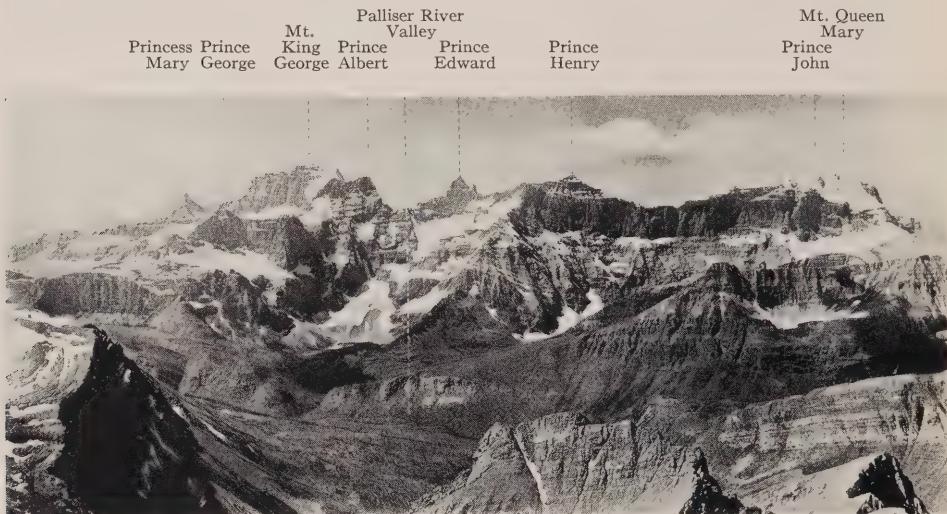
UPPER KANANASKIS LAKE  
and Upper Kananaskis Valley

Joffre Creek, as it rises just under the mountain. The valley is well timbered along its bottom slopes but high up the timber has been badly burned. An old, disused trail leads up it and over the divide to the White River Valley, whence it ascends the eastern side-slopes and connects with the Elk Valley trail near Riverside Camp.

Three Isle Lake South Station is at the head of a wide shale-filled valley extending two miles southeasterly from Three Isle Lake; from the station the watershed follows the ridge between this valley and the valley of Joffre Creek for two and three-quarter miles in a northwesterly direction to the camera station shown on the map as Mt. McHarg.

Mt. McHarg Camera Station stands at the head of a pear-shaped body of snow, three-quarters by half a mile in area, which drains to the western arm of Three Isle Lake. The watershed line circles this on the south and west, traversing the crest of the ridge, from which the slopes fall directly to Palliser River; a mile from Mt. McHarg Station, at the last high point of the ridge, 9130 ft., the watershed turns nearly due east and descends a mile and a quarter to the lowest summit of South Kananaskis Pass, 7439 feet in altitude above sea-level.

At Mt. McHarg Station the valley of Palliser River is many miles wide from crest to crest; the U-shaped trough of the river is flanked by steep, high ridges and benches of rock. Below the approach to South Kananaskis



THE ROYAL GROUP

Pass the stream presents a wide gravel bed with channels flowing in many directions; the sides of the trough are covered by brûlé and dense windfall obstructs the trail leading up the valley where it does not follow the gravel bed. The course of the stream is southeast for about fifteen miles, when it turns southwest and flows between steep, rugged peaks and ridges to join the Kootenay River.

Directly west across the valley, which it flanks, is a very remarkable group of mountains comprising seven distinct peaks, the highest having an altitude of 11,226 feet; it is much in evidence, and its towers and precipitous walls, its glaciers and outlying ridges dominate the landscape from all directions. It was first noticed in 1913 by the Topographical division from Wonder Peak, close to Mt. Assiniboine, and the name of "Mt. King George" was then given to the highest summit. The Commissioners now suggest that the title of "The Royal Group" be applied to this collection of peaks and that the names

of the Royal Family be placed upon its several summits, as shown on map sheet No. 10.

To cover the portion of the watershed extending from Elk Pass to South Kananaskis Pass the following camera stations were occupied, viz:—Inter-lakes, 8710 ft., Elkan, 8948 ft., Elk Lake West, 8349 ft., Hogback, 5940 ft., Lakeview, 9583 ft., Lyautey N., 7443 ft., Surprise, 9504 ft., Three Isle Lake South, 9226 ft., Cornice, 8493 ft., No. 1 Joffre W., 8347 ft., No. 2 Joffre W.,



Mt. BEATTY, 9841 ft.  
From the North

8373 ft., Mt. McHarg, 9476 ft. and Three Isle Lake West, 8325 ft. For topography along the watershed and other information see Atlas, map sheets, Nos. 9 and 10.

#### SOUTH KANANASKIS PASS TO NORTH KANANASKIS PASS

From the summit of South Kananaskis Pass the watershed line ascends directly to the crest of the ridge dividing the South Pass from the North Pass, not far from its southern extremity, on which Surprise Camera Station is set; it follows the crest northward one and three-quarter miles to the highest peak

of the ridge, 9841 feet in altitude. The name Mt. Beatty has been given to it in honour of the famous British admiral; Mt. Beatty is a fine, snow-clad peak, sending a picturesque glacier down to near the summit of the North Pass. An outlying spur extends from the peak, southwesterly, to the Palliser Valley to form the western gateway of the South Pass. From Mt. Beatty the watershed follows the ridge northwesterly to its end where it sinks to form the gap and summit of the North Pass, one and a half miles distant. The spur referred to and the end of the ridge are the southern boundaries of the valley of the stream flowing to Palliser River from the North Kananaskis Pass.

#### NORTH AND SOUTH KANANASKIS PASSES

*History and Origin of Name.*—Kananaskis Pass first appears on Palliser's Map, published in 1863. It was so called by Capt. Palliser after the name of an Indian, of whom there is a legend giving an account of his most wonderful recovery from the blow of an axe, which stunned but had failed to kill him, and the river which flows through the gorge also bears his name (See Palliser's Report, Page 93, August 17th, 1858.)

In 1848 Capt. Palliser learned of the existence and location of the pass from a half-breed named James Sinclair who had been through the mountains by that route, and in 1858, the second year of the Palliser Expedition, he traversed it and followed the valley of Palliser River to the Kootenay River Valley on his way to Fort Colville.

Capt. Palliser does not appear to have known of the existence of South Kananaskis Pass, as he makes no mention of it in his report.

*Topography and Characteristics, South Kananaskis Pass.*—The two streams forming the main sources of the Upper Kananaskis River unite about three miles above the western end of Upper Kananaskis Lake. They flow in the valleys of the two passes on the Alberta side of the watershed. Half a mile southeast of the summit of the South Pass is a good-sized lake, which has been named Three Isle Lake on account of the fact that there are three little islands in it. There is no visible outflow from the lake, although it serves as a catchment basin for a considerable area, but beyond the eastern rim of the basin, about half a mile from the lake, a strong-flowing stream emerges from the steep hillside forming the eastern approach to the pass and flows down the hill to join a much larger, glacier-fed stream coming in from the south at the foot of the hill; together they flow little more than a mile farther to join with the stream from the North Pass. A very faint trail, which had been recently cut out as far as the lake, leaves the main trail at the fork of the stream and leads over the pass summit.

On the west side of the summit, about a mile distant, is a smaller and most picturesquely situated lake, beyond which the trail leads through a narrow gorge and descends a very steep rock-slide; it then descends a valley, in which all the timber has been burned, over a rough course much obstructed by

fallen timber, to a very wild spot where a stream emerges from springs lying between great blocks of fallen rock and cascades down a narrow, rugged gorge of exceedingly steep slope to join Palliser River; the gorge is impracticable for travel and the trail, here quite obliterated by a maze of fallen logs, climbs the hillside and reaches the Palliser River by the valley of the stream from North Kananaskis Pass.

The total distance from the summit to the Palliser Valley trail is about three and a half miles by the route travelled. The general direction of the pass is west-northwest and the altitude of its lowest summit, which lies just at timberline, is 7439 feet. It is a narrow V between the enclosing mountain

Summit of Pass      Lakeview Station

Three Isle Lake S.  
Mt. Joffre Station



THREE ISLE LAKE AND SUMMIT OF SOUTH KANANASKIS PASS

ridges and, owing to the steep, rugged approaches on both sides is not suited for a road. No monument survey was made of it.

*Topography and Characteristics, North Kananaskis Pass.*—The main trail follows the north branch of Upper Kananaskis River, which winds in a deep-cut, V-shaped valley and flows from a glacier at its head. Half a mile from the fork, the trail ascends a very steep hillside for about 1300 feet to a high plateau of rolling alplands, where there are several small lakes and a conspicuous rock-slide. The country here is open with scattered groves of spruce, balsam and larch. From the fork of the river to the summit of the pass is about five miles. A small lake is seen at the summit, the watershed line lying just along its western edge and only a few feet above it.

The surroundings are wildly picturesque and imposing; several glaciers fill amphitheatres between the encircling peaks, one of which comes down close to the summit of the pass from the base of the high, snow-clad peak

named Mt. Beatty. On the north side, close by, is another glacier and still another lies at the head of the main stream. Between and around them are a number of high peaks of over 10,000 feet altitude. One in particular, 11,174 feet, rising directly above Palliser Pass on the east side has been named Mt. Sir Douglas, after Field Marshal Sir Douglas Haig, and others not quite so lofty have been named after commanders in the British navy and army who have made for themselves great war records in the service of the Empire; see *Atlas, map sheets, Nos. 10 and 11.*

Main  
Upper Kananaskis River      High Plateau  
crossed by trail      Mt. Joffre



PLATEAU—EAST APPROACH TO NORTH KANANASKIS PASS

The streams from the glaciers on the north and south sides of the pass summit meet close by the trail and drop perpendicularly into a rock-well at the head of a very remarkable box-canyon; this well and the force of the falling water have suggested the name Turbine Canyon; there are five natural bridges across it and in several places the chasm is so narrow that it can be stepped across. The stream descends in a series of cascades and falls to join the main Upper Kananaskis River, 1000 feet below.

On the west side of the watershed, the pass descends very steeply for 1500 feet and the trail zig-zags down the incline to the valley of a stream

tributary to Palliser River, which flows from the western lobe of a glacier on the east and south slopes of Mt. Sir Douglas: the main body of the glacier discharges eastward by the stream flowing to Turbine Canyon.

The direction of the pass is northwest and southwest, and the altitude of its lowest summit 7682 feet. It is a narrow gap between the peaks and of no commercial value for a road. No monument survey was made of it.

#### NORTH KANANASKIS PASS TO PALLISER PASS

As the crow flies, Palliser Pass lies only four miles west-northwest of North Kananaskis Pass, but by the sinuosities of the watershed the distance is more nearly seven.



Mt. SIR DOUGLAS, 11,174 ft.  
From the Southeast

Leaving the summit of North Kananaskis Pass the watershed line ascends perpendicularly the precipitous face of the ridge directly north, of which the strata stand straight on end; at the crest of this knife-edge ridge it turns sharply westward and passing over the highest point at 9980 feet altitude drops to the snowfield below; crossing the same it ascends to the northeast corner of a peak showing from this direction a remarkable square top and then on to its crest at 10,400 feet. Now dipping in a U-shaped curve it ascends the eastern ridge of Mt. Sir Douglas to its highest point.

The same ridge continued southeast of the watershed ascends to the south corner of a peak of 10,600 feet altitude and then over the peak on which the camera station, Sir Douglas East, is set, altitude 10,065 feet; these two peaks and a third one to the north-east, of 10,300 feet altitude, contain the glacier supplying the main source of Upper Kananaskis River.

Mt. Sir Douglas and the three peaks, 10,400 ft., 10,600 ft. and 10,300 ft. respectively send out imposing, broken and jagged ridges northward to

the valley furnishing a high pass from Mud Lake Valley to the valley of the upper waters of Spray River, north of Palliser Pass.

The watershed passes over the ridge-like crest of Mt. Sir Douglas and descends its western ridge, which is extremely precipitous near the crest of



TURBINE CANYON

the mountain and of the knife-edge variety in other parts, to the summit of an outlying eminence of the ridge on which Brass Bolt and Cairn 11 E were set, at the eastern extremity of the monument survey of Palliser Pass.

The following camera stations were occupied, viz.: Kananaskis Pass East, 9106 ft., Mt. Beatty, 9841 ft., Sir Douglas East, 10,065 ft. and King George North, 8757 ft.; see Atlas, map sheet No. 10.

## PALLISER PASS

*History and Origin of Name.*—Palliser Pass is so called from the fact that its summit is at the head waters of one of the sources of Palliser River, which stream has been named after Capt. John Palliser who was in charge of the British Expedition to Western Canada from 1857 to 1860.

A faint trail from the Palliser Valley leads over the summit and descends the slopes on the Alberta side to the valley of Spray River; that the pass was an Indian route of travel is indicated by the number of old tepee poles on both sides of the divide at camping spots along the trail. On the Palliser side the trail is rough and greatly impeded by fallen trees; on the Spray side, it lies for several miles through open grassy meadows.

*Topography and Characteristics.*—The general direction of the pass is north-northwest. The summit lies in a grassy meadow about half a mile

Mt. King Albert   Mt. Queen Elizabeth      Spray River Valley  
Summit of Pass      Palliser River Valley



PALLISER PASS

long in a north and south direction, and rather more than a quarter of a mile wide between the containing mountain slopes, at an altitude of 6836 feet above sea-level.

The meadow is broken by two small lakes and some timbered knolls. Several other small lakes of a rich blue color and a number of glaciers, waterfalls and groves of green conifers make the pass one of the most beautiful yet surveyed by the Commission. Unfortunately most of the surrounding timber has been killed by fire. There are a number of fine mountains in the immediate vicinity, chief among which is Mt. Sir Douglas; the mountain rises to an altitude of 11,174 feet directly on the east side of the summit of the pass and the watershed line passes over its crest.

The approaches to the pass summit are steep on both sides; that from the valley of the Spray River rises between 500 and 600 feet in the last mile

and a half, while the approach from the Palliser River Valley rises 1000 feet in the same distance.

One striking feature of Palliser Pass, as disclosed by the survey of the watershed, is the possibility that at some by-gone period the water from the catch-basin formed between Mt. Back, Mt. King Albert and Mt. Queen Elizabeth flowed northward into Alberta, although at the present time it follows a well-defined channel into British Columbia. Monument 1 E is at the extreme southern edge of the plateau, which has been described as forming the summit of the pass, at the head of a well-defined, dry, shallow channel with a nearly uniform fall to the north all the way to the larger of the two small lakes referred



SUMMIT OF PALLISER PASS

to, which collects the flow from a near-by glacier and forms the extreme source of Spray River; this fact and the conformation of the lower slopes of Mt. Back, together with the general direction of the creek which drains the catch-basin, make it seem possible that the dry channel leading north was the original bed of the stream which, at some later period, carved a channel for itself into the valley of Palliser Pass.

*Boundary Line.*—The characteristic letter of Palliser Pass is E and five concrete monuments were built to define the survey in the pass. Monument 1 E is at the summit. Monument 2 E was built on the west side at a point from which the line of watershed ascends the steep sides of Mt. Queen Elizabeth and the last straight-line course in this direction extends from Monument 2 E to Brass Bolt and Cairn 4 E on the summit of Mt. Queen Elizabeth. On the east side of the pass, Monuments 3 E, 5 E and 7 E were built, and the last straight-line

course extends from Monument 7 E to Brass Bolt and Cairn 9 E. The total length of straight-line boundary surveyed at Palliser Pass summit is 175.025 chains. Brass Bolt and Cairn 11 E were placed on the outlying eminence of the west ridge of Mt. Sir Douglas, previously mentioned.

The following camera stations were occupied by the Topographical division, viz: Mt. Back, 9883 ft., Mt. Queen Elizabeth (4 E), 9349 ft. and 11 E, 8428 ft.; see Atlas, map sheets, Nos. 11 and 11 A.

#### PALLISER PASS TO SPRAY PASS

From Brass Bolt and Cairn 4 E on the summit of Mt. Queen Elizabeth the watershed turns west and travels less than half a mile to the summit of Mt. King Albert, named after the heroic King of the Belgians; it then swings north a mile and a half to the summit of Mt. Leman, from that point falling a mile and a quarter to the lowest summit of Spray Pass. The name Leman has been conferred in honour of the famous Belgian General.

Mt. King Albert is 9800 feet in altitude and supports a very symmetrical snowfield and glacier on its northeastern flank, which supply the farthest source of Spray River. On the eastern side of these two mountains the Spray River flows northward to the Bow River, and on the western side is the stream flowing from the summit of Spray Pass, which either joins Cross River, a tributary of the Kootenay, or else flows direct to the Kootenay River. It has been named Albert River after the mountain.

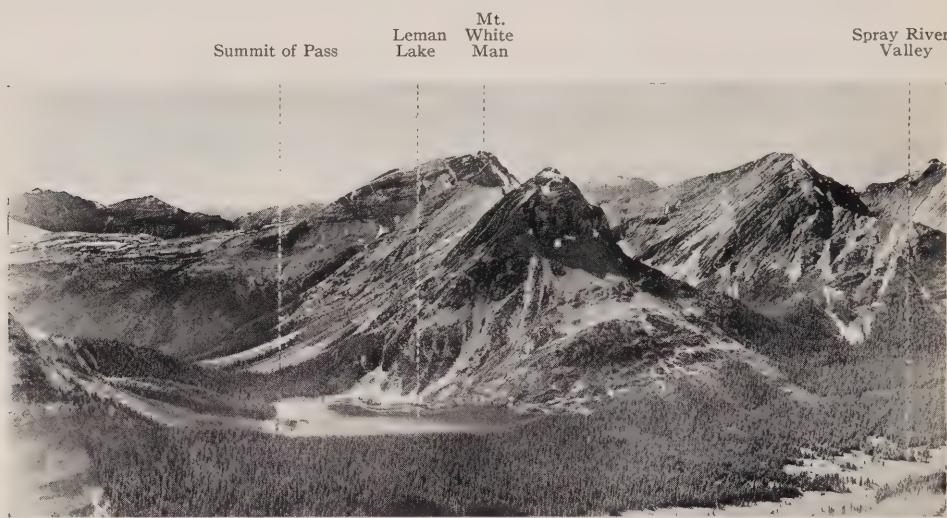
#### SPRAY PASS

*Origin of Name.*—Having reached the foot of the steep hill on the Alberta side of Palliser Pass, a wide meadow-land bottom with excellent grass opens out in the valley for about two miles northward to where the timbered slopes draw together, leaving but a narrow open space for a passage. The trail keeps on the west side of the stream and, just beyond the narrow part, a branch trail leads southwest to a good-sized and beautifully picturesque lake situated almost at the summit of a low, timbered pass over the continental watershed. The summit of the pass is some nine chains west of the lake and about twenty feet higher; it lies at a computed altitude of 6275 feet above sea-level. At the north end of the lake is a very remarkable little canyon, with sides about fifty feet high, where a rockfall has dammed the outflow from the lake and caused it to seek a subterranean passage; it reappears lower down the canyon. The stream flowing from the lake and the stream from Palliser Pass, to which it is tributary, form the main source of Spray River; hence the name, Spray Pass.

The summit of the pass is a narrow, V-shaped gap between steep mountain sides; the direction here is northeast and southwest and presents a very easy approach from the Spray Valley; on the British Columbia side the fall is much steeper and the valley beyond densely timbered with green forest. No monument survey was made.

It was not ascertained by the Commissioners whether the stream on the British Columbia side was a tributary of Cross River or whether it flowed direct to Kootenay River, but the latter seemed to be the case. The trail on the western side is nearly obliterated, at any rate near the summit of the pass; on the Alberta side it is much better marked and within two miles joins the Spray Valley trail in open meadow-land.

Mt. Leman, a prominent peak with a very noticeable snow-field at its summit, stands directly south of the lake, which has been named after the mountain.



SPRAY PASS

In connection with this portion of the survey four camera stations were occupied, viz: Sir Douglas North, 8507 ft., Mud Lake, 8401 ft., Mt. Leman, 8956 ft. and Albert North, 8889 ft.; see Atlas, map sheet No. 11.

#### SPRAY PASS TO WHITE MAN PASS

From the summit of Spray Pass, the watershed line ascends directly for three-quarters of a mile to the top of a high point of the ridge bounding the pass on the northwest, altitude 8900 feet. It then follows the ridge westerly to Albert North Station, distant half a mile, thence, on an erratic course, a mile and a half to the summit of the eastern peak of Mt. White Man, 9610 feet, and then a third of a mile farther to the western and higher summit at 9768 feet. From this point the watershed descends the very steep north ridge of the mountain one mile to Brass Bolt and Cairn 5 D, situated on the crest of an outlying eminence of the ridge, directly above and dominating the White Man Pass summit from the southeast.

Beyond Spray Pass the ridge of peaks bordering the Spray River Valley on the west extends northward, showing deep indentations on its eastern side, from which tributary streams flow to swell the volume of Spray River. Seen on the map the ridge resembles a jagged-toothed saw, of which the end or tip confines the valley of the south branch of White Man Creek, flowing north-easterly to join the Spray. On the British Columbia side of the pass, directly south of Mt. White Man, is a high, rocky, plateau-like tract from which streams flow west to Cross River and southeast to Albert River. In the Cross River direction several very striking pinnacle-like towers are seen; a number of small snowfields and glaciers are also seen, and several little lakelets at the base of Mt. White Man.

To survey this section of the watershed, camera stations were occupied as follows: Yellow Lake, 8866 ft., Smuts W., 8835 ft. and Spray Pass East, 9181 ft.; see Atlas, map sheet, No. 11.

#### WHITE MAN PASS

*History and Origin of Name.*—Sir George Simpson in his narrative of his journey across the mountains in 1841 makes mention of a party of emigrants who came from the west that same year by way of Kootenay River and one of the passes through the mountains under the guidance of an Indian named Bras Croche. The party probably travelled by White Man Pass.

In 1845 the Reverend Father J. P. De Smet ascended the Columbia River and crossed the main range by a pass that seems almost certain to have been White Man Pass. In his book, "Oregon Missions and Travels over the Rocky Mountains in 1845-6," he describes the erection of a cross at a point at which he traversed the watershed; he refers to it as the "Cross of Peace."

The branch of the Cross River flowing southward from the summit of the pass to the Kootenay River is, according to Dr. G. M. Dawson, called by the Stoney Indians, "Tsha-kooap-te-ha-wap-ta," in allusion to the circumstance related by them that some early traveller set up a cross in the pass not far from the summit, probably De Smet.

The White Man Pass furnishes the most direct line of travel between the Bow and Columbia River Valleys, leaving the former at Canmore on the main line of the Canadian Pacific Railway and entering the Kootenay Valley at the junction of Cross River. About five miles above the junction the Sinclair Pass gives access between the Brisco and Stanford Ranges and enters the Columbia Valley some six or seven miles below Wilmer.

*Topography and Characteristics.*—The general direction of the White Man Pass is northeast and southwest. Its summit consists of a rocky, open-timbered ridge about a mile long, between the bases of two confining peaks of a secondary character; the lowest part is at an altitude of 7112 feet above sea-level. The ridge is a very peculiar feature: it stands up at the apex of the pass like a well-

marked barrier and is nowhere more than two chains wide; its general direction is northwest and southeast.

Immediately beyond the ridge, on the Alberta side, and only 120 feet below its lowest part is a pretty, little alpine meadow with a lake in its centre. The meadow extends northeasterly for about a quarter of a mile to a very pronounced lip or rim, over which the stream from the lake plunges down a rocky canyon for some six hundred feet in less than half a mile; then, almost

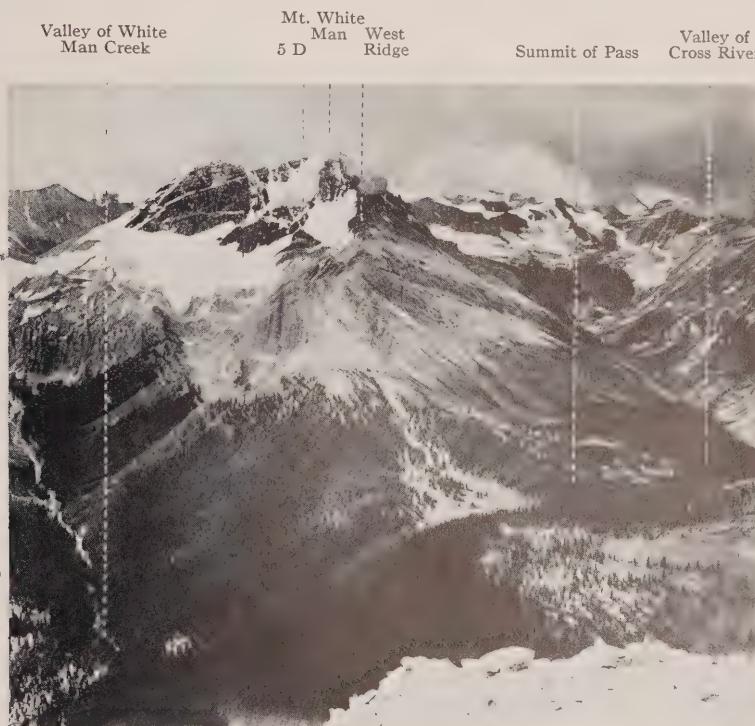
6 D



RIDGE AT SUMMIT OF WHITE MAN PASS  
Showing Boundary Line

immediately, it joins the main south branch of White Man Creek, which has its source in a glacier and a lake on the northern slopes of Mt. White Man. Some three and a half miles farther on the stream joins the north branch of White Man Creek, flowing from the west, and half a mile beyond enters the Spray River, a tributary of the Bow River, which it joins at the Village of Banff. The valley of the south branch of White Man Creek presents several fine alpine meadows, where grass grows in great luxuriance, but for the most part it is a deep V-shaped valley heavily timbered along the narrow bottom and for some distance up the sides.

*Boundary Line.*—The characteristic letter of White Man Pass is D. Four concrete monuments were built to define the survey in the pass. Monument 1 D is at the lowest summit of the pass. Monuments 2 D and 4 D were built at points along the watershed to the northwest from 1 D, and the last straight-line course in this direction extends from 4 D to Brass Bolt and Cairn 6 D. Monument 3 D occupies a prominent point of the watershed to the southeast of 1 D, and the last straight-line course in this direction extends



WHITE MAN PASS

from 3 D to Brass Bolt and Cairn 5 D. The total length of straight-line boundary surveyed in White Man Pass is 128.167 chains.

Bolt 5 D, as previously stated, is on the crest of an outlying eminence of the north ridge of Mt. White Man; Bolt 6D is on an outlying eminence of a ridge extending northerly at right angles to the southeastern ridge of Mt. Red Man; Bolt 8 D is on this southeastern ridge at the point where the northerly ridge branches from it; and Bolt 10 D is on the summit of Mt. Red Man. The following camera stations were occupied by the Topographical division, *viz*: 5 D, 8222 ft., 6 D, 8243 ft., 8 D, 8843 ft. and 10 D (Mt. Red Man), 9493 ft.; see *Atlas*, map sheets Nos. 11 and 11A.

## WHITE MAN PASS TO ASSINIBOINE PASS

The northwestern side of White Man Pass is dominated by Mt. Red Man and the bold, precipitous escarpment of its southeastern ridge. Midway of the escarpment extends the northerly ridge which is traversed by the watershed line; west of this ridge, a glacier sends water flowing to the north branch of White Man Creek, and east of it a wide amphitheatre collects water supply for Cross River.

Stream from  
Assiniboine Pass

Marvel Lake Mt. Eon

Mt. Aye



LAKE MARVEL

The watershed line follows the edge of the escarpment to near the summit of Mt. Red Man, from which point it follows a sharp ridge northwesterly to the summit of a peak of 9200 feet altitude, a mile distant, and then drops quickly to a divide between the north branch of White Man Creek and a tributary of Cross River, at 7600 feet. Still keeping the same general direction, it now rises to another peak of 9200 feet, a mile and a quarter farther on, and then to a double-topped peak of 9400 feet, half a mile beyond; these two last mentioned peaks present bold, precipitous escarpments on the White Man Creek side and easier slopes carrying snow on the southwest. From the highest point of the double-topped peak the watershed line descends to a crossing of

the divide at the head of the north branch of White Man Creek, 7890 feet in altitude, just above timberline. Now rising to the west end of a ridge between the extreme head of the north branch of White Man Creek and a stream flowing in the opposite direction to Marvel Lake, at an altitude of 8660 feet, it again descends to still another pass over the continental divide, a short mile from the end of the ridge. This little pass is a small affair and separates waters flowing to Mitchell River from those flowing to Bryant Creek, by way of the valley next adjacent on the southeast; in this valley there is a fine little lake,



MARVEL PASS

named Owl Lake, fully half a mile in length, and an alpine meadow not far from its head, but nearly all the green timber has been killed by fire.

The altitude of the little pass is about 7300 feet and directly from it the ground falls for 250 feet more to the lowest summit of a very marked pass over the watershed, between the basin of Lakes Marvel and Gloria and the southern source of Mitchell River, lying at an altitude of 7050 feet. The more level portion of this U-shaped trough, or what was once a U-shaped trough, is about a mile across; it is somewhat broken and irregular of surface, and a number of small lakelets and ponds are scattered about; northward, it soon falls to Marvel Lake, a thousand feet below, and southward the valley curves quickly to the west and joins Mitchell River Valley just below Assiniboine Southwest Camera Station. The valley is very bleak and desolate

looking; all the timber has been burned, and bare rock ledges and scree slopes are very prominently in evidence. This pass and valley define the east and south boundaries of the Assiniboine group of peaks. The pass is here designated Marvel Pass and its surroundings are very fine from a scenic point of view. No monument survey was made of it as it did not appear to be of any value as a means of communication in the near future.

In Chapter III, under the heading "Simpson Pass to Mt. Assiniboine," the great bend of the watershed line where it turns from its general southeastern direction and swings three miles west, at right angles, in order to traverse the Assiniboine group of peaks and then return to its original course is described. This great bend contains the glacial basin of Lakes Gloria and Marvel; Wonder Pass over the continental divide stands near the northerly inception of the bend and Marvel Pass at the southerly inception, almost exactly opposite to it.

A short distance from the lowest part of the summit of Marvel Pass, the watershed line rapidly climbs the precipitous cliffs that buttress the elevated snow-field lying above the valley of the pass on the west; it crosses this snow-field near its southern extremity and follows the ridge forming the southern boundary to the southeast corner peak flanking the Eon snow-field at 9500 feet altitude; the watershed line now falls 1000 feet to the bottom of the gap between the peak last mentioned and Mt. Eon, and then, on a western course, climbs swiftly to the summit of Mt. Eon at 10,860 feet above sea-level. From the summit of Mt. Eon the watershed line curves around the western extremity of the great bend over Mt. Aye, 10,640 ft. and so on to summit of Mt. Assiniboine at 11,870 feet altitude. From Mt. Assiniboine on the course of the watershed is fully described in Chapter III.

The following additional camera stations were occupied, viz.: Mt. Currie, 9268 ft., Bryant Creek North, 8425 ft., Marvel Lake North, 8264 ft. and Mt. Towers, 9337 ft.

#### ASSINIBOINE PASS

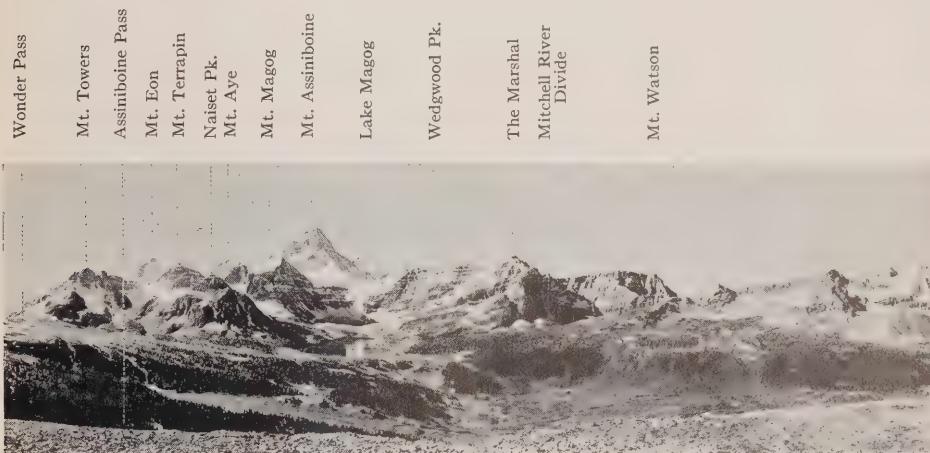
*History and Origin of Name.*—The summit of Assiniboine Pass is four and one third miles, in direct distance, nearly northeast of Mt. Assiniboine. It is at the crossing of the continental watershed by the trail from Banff, via Spray Lakes and River, and Bryant Creek, to the great massif. The trail follows the most easterly of the two principal routes available from Banff, the westerly one being by way of Bow River Valley, Healy Creek and the headwaters of Simpson River. There is a third route, via Brewster Creek Valley, which branches from Healy Creek Valley and joins Bryant Creek Valley about two miles southeast of the summit of Assiniboine Pass.

The Assiniboine group of peaks, of which the central massif is a peak of the great divide, is one of the most attractive beauty spots of the Canadian Rockies and is renowned wherever they are known. The group is much visited by tourists and mountain climbers, and visitors generally make a round trip, going by one trail and returning by the other. On this account the pass has

been referred to as Assiniboine Pass by the Commission. The summit is a wildly beautiful spot and presents many features of great scenic interest.

In the year 1913, a survey was made by the Topographical division of the watershed across this pass and of the vicinity (see Chapter III under heading "Simpson Pass to Mt. Assiniboine"), but it was not until 1916 that an opportunity offered to closely examine it and a decision was arrived at to make a monument survey.

*Topography and Characteristics.*—The pass has a general direction northwest and southeast. The summit lies at an altitude of 7152 feet. On the



THE ASSINIBOINE GROUP

Alberta side the drainage flows to Bryant Creek, a good-sized stream flowing from Marvel Lake to join the Spray River at the entrance of the valley leading to White Man and Palliser Passes. About two and a half miles above the junction a strong-flowing spring breaks from the hillside about 100 yards north of the trail and joins Bryant Creek, and just east of Marvel Lake, Owl Lake sends its outflow to join Bryant Creek from the south. On the British Columbia side the drainage is to the headwaters of Simpson River flowing to Og Lake.

At the summit it is a wide, well-timbered pass, dominated on the southwest by the great group of peaks from which it is named. The approach from the Alberta side is very steep for the last 600 feet of altitude, while that from the British Columbia side is so gradual as to be scarcely noticeable. The actual summit of the pass consists of a series of grassy depressions, broken by timbered knolls and ridges, which have no direct surface-channel drainage, and forms a somewhat intricate problem of watershed determination; the lowest part is at the very edge of a small pond, and the difference of elevation between the water surface of the pond and the summit is so slight as to be

negligible; it has been treated as a summit pond and one of the courses defining the boundary has been made to pass across its centre. Northwest of the pond the ground falls more rapidly.

On the Alberta side, the approach is very impressive; a great barrier of rock, up which the trail zig-zags, closes the head of the valley about half a mile from the summit of the pass. On either side the barrier extends in mighty precipices, those on the north disclosing near sky-line a colossal cave entrance, so placed as to be practically impregnable; it has given the name

British Columbia Approach      Summit of Pass      Mt. Ball      Alberta Approach



ASSINIBOINE PASS

Cave Mountain to the eminence on which it is set. On the opposite side two wonderful rock faces rise perpendicularly above the valley floor for 2700 and 2500 feet respectively, the higher or eastern one being shown on the map as Gibraltar Rock and the other as Cascade Rock, a glacier in the depression between them sends a remarkable waterfall in a straight drop of over 1000 feet to the valley below. These two very spectacular heights are outliers of Mt. Cautley.

*Boundary Line.*—The characteristic letter of Assiniboine Pass is J. Six concrete monuments were built to define the survey in the pass. Monument 1 J is built on a timbered knoll near the centre of the broken ground forming

the summit of the pass. Proceeding northerly and northeasterly from 1 J, Monuments 2 J and 4 J were built and Brass Bolts and Cairns 6 J and 8 J were placed, the last straight-line course in this direction extending from Bolt 6 J to Bolt 8 J. The course from 6 J to 8 J lies on the flat top of Cave Mt., which contains Assiniboine Pass summit on the north side; Bolt 8 J is near the edge of a tremendous escarpment falling precipitously into the deep, narrow valley of Og Pass, to the north of it.

Lunette Pk. Mt. Assiniboine



Mt. ASSINBOINE 11,870 ft.  
From East

Proceeding southeasterly from 1 J, Monuments 3 J, 5 J and 7 J were built, the last straight-line course in this direction extending from Monument 7 J to Brass Bolt and Cairn 9 J, placed on a shoulder of the northwest ridge of Mt. Cautley midway between 7 J and 11 J. Brass Bolt and Cairn 11 J was placed on the summit of the middle shoulder of the same ridge, a third of a mile farther on. The total length of straight-line boundary surveyed in Assiniboine Pass is 206.805 chains.

Camera stations were occupied by the Topographical division at 6 J, 8562 ft. and 9 J, 8587 ft.; see Atlas, map sheets Nos. 12 and 12 A.

## WESTERN FACE OF ASSINIBOINE GROUP

As recorded above the watershed line is deflected in a great loop from its southeasterly course and swings some three miles west to pass over Mt. Assiniboine and a number of outlying peaks of the group. In order to map the western side of the group, it was necessary for the Topographical division to descend the valley of Mitchell River for a distance of about fifteen miles.

Mt. Assiniboine  
Lunette Pk.



Mt. ASSINIBOINE 11,870 ft.  
From West

Mitchell River heads in Sunburst Valley, which is separated by a divide, some 7300 feet in altitude, from the main valley running north and northwest from Mt. Assiniboine in which Simpson River has its source from springs situated nine miles distant down the valley; an easy ascent between the northerly extension of Wedgwood Peak on the south and Nub Peak on the north leads from one valley to the other. In the gap, quite near the summit of the divide, are two beautiful lakes, above whose waters rise towering precipices of rock; the upper and smaller one is shown on the map as Sunburst Lake;

the other, which is quite a bit larger, is named Cerulean Lake on account of its sky-blue colour.

The valley of Mitchell River opens westward, for a distance of four miles, in long slopes of somewhat marshy ground, covered for the most part by burnt timber and windfall with bunches of green conifers scattered here and there; the valley then narrows and becomes more heavily forested with green timber, and, making a long sweeping curve, assumes a generally southeast direction to the junction of Mitchell River with Cross River, flowing from White Man Pass. An old trail leads over the divide and down the valley, but it is nearly obliterated and very seldom used.

At the end of the curve, when the valley has straightened out on its general southeastern course, a long sharp ridge, extending southerly from Centurion Peak, is seen bounding the valley on the east side. Beyond this ridge another valley, heading in a cirque at the southern base of The Marshal separates it from the main mass of Mt. Assiniboine; at the head of the valley is a little, light sky-blue lake of a shade very seldom seen in the lakes of the Canadian Rockies.

Camera station, Assiniboine Southwest, 7980 ft. was occupied on a higher point at the south end of the ridge; it commands a view of the valley of the stream flowing from Marvel Pass, which forms the southern limitation of the Assiniboine Group, and of its junction with Mitchell River. Another station, Mitchell River East, was occupied on the same ridge at 7860 ft., and a third, Mitchell River Bend, 6495 ft., on the opposite side of the valley. These three stations were sufficient to enable the western part of the Assiniboine Group, which is defined by the valley of Mitchell River, to be mapped.

The appearance of Mt. Assiniboine and its outlying peaks on this side is quite as spectacular and imposing as on the north and east; in addition a very fine view is obtained of the southern outliers of the group, Mts. Aye and Eon. Just below Assiniboine Southwest Station a very remarkable canyon is seen in the bed of Mitchell River.

#### GENERAL REMARKS ON THE COUNTRY ADJOINING THE SEASON'S SURVEYS

The section of mountain country traversed by the continental watershed, as described in this Chapter, is exceedingly wild and intricate; while, as a rule, the main valleys follow the general direction of the ridges, which in turn keep the general northwest and southeast trend of the range, there are subsidiary valleys branching in every direction, leading to deep amphitheatres at their heads, often holding glaciers. Lakes, large and small, are on all sides, and there is much snow and ice; snow-fields lie along the crest of the range, at the base of its culminating peaks, and many glaciers flow from them; hanging and cliff glaciers are also seen high up on the steep sides of the mountains.

The timber is of the same character as described in Chapter V: chiefly pine, *Pinus Murrayana*, spruce, *Picea Engelmanni*, balsam, *Abies Subalpina*

and larch, *Larix Lyallii*. No large areas of merchantable timber were seen although trees of comparatively large size, spruce and larch, were noticed on the slopes surrounding Upper Kananaskis Lake on the south and west sides, at the fork of Upper Kananaskis River and on the approaches to Spray Pass. Larch and spruce up to thirty inches in diameter were seen at Assiniboine Pass summit and in its vicinity, but there was no considerable quantity. Throughout the area described, by far the largest part of the timber has been fire-killed and is now seen as dry standing skeletons or as fallen trunks littering up the valleys and impeding travel.

The game representation was as usual, but no mountain sheep were seen. On the high crags above timberline, wild goats abound; bears and small deer are in the woods but not in great quantities. A number of grizzly bears was seen in the vicinity of Assiniboine Pass. Mr. Cautley reports that on one occasion a grizzly was encountered by his assistant and two men, and, although he made no attempt to attack them, neither did he allow their presence to interfere with his occupation of excavating gophers, so that the party were unable to go on with their work for over an hour; on another occasion a grizzly charged one of Mr. Cautley's packers, who was mounted at the time and had no difficulty in getting away; on a third occasion Mr. Wheeler and one of Mr. Cautley's men had an enormous grizzly, whose track in the snow measured ten and a half inches, pass within a hundred yards of them, near Monument 7 J, and, although they were in plain sight for a long time before the bear passed them and his course brought him constantly nearer, he never deviated from it or deigned to show any sign that he was conscious of their presence; not having a rifle and considering discretion the better part of valour, they both took to trees. Moose were reported in the Mud Lake Pass Valley but none were seen. Woodland grouse were frequently met with and ptarmigan on the rocky slopes above the timber.

There are fish in Lower Kananaskis Lake and in Lower Spray Lake and its outlet, where a fish hatchery has recently been built, but none were seen in any of the streams higher up.

#### MAPS

In the Atlas, map sheets Nos. 9, 10, 11 and 12, show the location of the watershed and the topography of its vicinity, the position and altitude of all camera stations that come within their limitation and other features of interest to the subject; map sheets Nos. 9 A, Elk Pass, 11 A, Palliser Pass, and White Man Pass, and 12 A, Assiniboine Pass, show the monument survey in the respective passes and the topographical features of its vicinity. Owing to the limitations of the map sheets, a number of the camera stations occupied, and some of the topographical features referred to are not shown but their positions have been indicated on the respective sheets as far as has been found possible.

## MAP CONSTRUCTION

The general map sheets referred to in the preceding chapters are numbered 1, 2, 3, etc. in order northerly, commencing at the International Boundary; they embrace for each sheet, as nearly as is practicable, fifteen miles in latitude and twelve miles in longitude.

The sheets having corresponding numbers and the letter A, are enlargements of the parts of the general sheets which contain monumented passes, and are intended to show clearly the details of the monument surveys and of the surrounding topography.

In some few cases the sheets overlap one another where it is desired to show the same features, such as passes, on both sheets or where the watershed, owing to its direction, lies too close to the margin to show the topography adjacent to it.

The limitation of the topographical area surveyed on either side of the watershed has been set at approximately two miles, although in some of the earlier constructed sheets the area mapped is considerably in excess of that limit. Such limitation has necessitated the omission of a number of topographical details referred to in the report. As far as possible all such have been indicated.

The maps are primarily constructed from surveys made by the method of photo-topography, and the surveys made of the straight-line boundary along the watershed across the passes are shown upon them.

The general sheets are on a natural scale of 1 to 62,500, and the lettered sheets on a scale of 1 to 25,000. Sheets 4 A and 11A are exceptions and are on a scale of 1 to 35,000. The contour interval is 100 feet and datum, mean sea-level.

The maps contain the following information, viz: general terrain in brown contours; snow-fields and glaciers in blue contours; lakes and permanently flowing streams in full blue lines; intermittent streams in broken blue lines.

The boundary where monumented across passes is shown by full black lines and between the surveyed passes by broken black lines.

Railways are in black; roads and trails in red.

The bearings and distances between monuments are placed in tabulated form on each of the sheets showing monument surveys across passes.

Each map sheet contains a general reference giving the signs used to indicate the boundary monuments, camera stations, topographical features, etc., that have been shown.

Altitudes are in feet above sea-level and are shown for all monuments and camera stations, and for each thousand-foot contour line.

The map sheets are embodied in an atlas, and an index at the commencement shows the location of the respective sheets, and their page numbers in the atlas.

In the report the various sheets are referred to by number where necessary to graphically illustrate the text.



## APPENDIX I

### DESCRIPTION OF BRASS BOLTS AND CAIRNS PLACED TO MARK THE LINE OF WATERSHED

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#### KICKING HORSE PASS

*No. 11 A.*—Monument 11 A was placed on the ridge extending northerly from Popes Peak, at the foot of the cliffs falling from the point where Monument 13 A is situated, and at an altitude of 7543.6 feet above sea-level.

A brass bolt was cemented in a hole drilled in light grey limestone rock, on the top of the strata and almost exactly at the junction where the said grey limestone is overlain by light brown cherty limestone.

The limestone shelf where the bolt was set has, from below, the appearance of a rounded knob. The bolt was placed 5.5 feet from the edge of the knob, measured in a northerly direction along the line of the divide, and 6 feet from the foot of the next steep ascent along the ridge to the south. At right angles to the line of the divide the knob is 11 feet in width.

Below the shelf a steep descent falls some 200 feet to a rounded shelf, where the formation is again light brown cherty limestone. Lyall's larch grows on the shelf.

Immediately to the east of the bolt the rock slopes very steeply to the bottom of the valley of the small glacier between Mt. Niblock and Popes Peak.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "11 A" on both ends and a "+" on the top.

A cairn 5.7 feet in height was erected over the bolt. A wooden pole with a target was placed in the centre of the cairn for reference from the line of concrete monuments in the valley.

*No. 13 A.*—Monument 13 A is situated at the end of a long narrow ridge running northerly from Popes Peak and overlooking the Kicking Horse Pass. It is set near the edge of cliffs falling to the ridge on which Monument 11 A was placed, and is at an altitude of 8169.8 feet above sea-level.

The point was marked by a brass bolt set in a hole drilled in shattered grey limestone rock and fastened there with cement.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "13 A" on both ends, and a "+" on top.

A cairn 6.0 feet high was built over the bolt.

*No. 15 A.*—Monument 15 A is situated on the summit of Popes Peak at an altitude of 10,360 feet above sea-level.

# MONUMENTS "A"—KICKING HORSE PASS



1 A. C.P.R. "Great Divide"



3 A



5 A. Looking up towards 7 A



9 A



11 A. Looking north



13 A. Looking south



15 A. On Popes Pk. looking N.W.



2 A



4 A



6 A



8 A. Looking N.E.



10 A. Looking S.E.

The greater part of the summit was covered by snow with rock showing at the northwest and southeast corners. Monument 15 A is placed on the rock at the northwest corner of the summit, and a brass bolt cemented in grey limestone rock.

Four feet northward from the bolt the rock falls very steeply to the valley above Ross Lake, and 8 feet to the southwest there is a straight drop for 600 feet to the valley leading to Cataract Creek.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "15 A" on both ends, and a "+" on top.

A cairn 5.3 feet in height was erected over the bolt.

*No. 8 A.*—Monument 8 A is situated on the slope of the easterly shoulder of Mt. Bosworth at an altitude of 7298 feet, close to timberline and at the end of the line cut through the timber from Monument 6 A.

The point was marked by a brass bolt cemented in a hole drilled in light grey limestone rock, near the edge of a rock ledge 24 feet wide.

Four feet to the east of the bolt is a sharp drop of twenty feet to a similar ledge. Below this come two other ledges, then an even, timbered slope falling to the east.

Above the ledge where the bolt was planted the slope ascends in a succession of sharp rises and rounded knolls to Monument 10 A, which can be seen from Monument 8 A on the crest of the shoulder.

A few stunted larch and spruce grow on the ledge to the southwest of the bolt.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "8 A" on both ends, and a "+" on top.

A cairn six feet high was erected over the bolt. A wooden pole with a target was placed in the centre of the cairn for reference from the line of concrete monuments in the valley.

*No. 10 A.*—Monument 10 A is situated at the end of the east shoulder from Mt. Bosworth at an altitude of 7859.7 feet. From the Kicking Horse Pass this shoulder appears to be the top of a separate peak.

The point was marked by a brass bolt cemented in a hole drilled in grey limestone rock. The rock is much shattered on the surface.

Three feet to the east of the bolt the slope falls steeply in a succession of ledges to monument 8 A.

Westerly from the bolt runs a rounded ridge rising gently to the foot of a rock wall ascending to the summit of Mount Bosworth.

Southerly the slope falls steadily towards Stephen on the Canadian Pacific Railway, and northerly is a very steep descent to the valley of Bath Creek.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "10 A" on both ends, and a "+" on the top.

A cairn 5.7 feet high high was built over the bolt.

*No. 12 A.*—Monument 12 A is situated on the highest point of Mt. Bosworth at an altitude of 9083 feet above sea-level.

The summit is the top of a large block of bluish limestone rock. In this block a hole was drilled and a brass bolt cemented therein.

To the north of the summit the rock falls quickly to the valley of Bath Creek and to the south, steep slopes drop to the Valley of the Kicking Horse River.

The brass bolt was marked "Alberta" and "British Columbia" on the respective sides, "12 A" on both ends, and a "+" on top.

A cairn was built over the bolt, with its base covering the block above mentioned and having a height of 3.4 feet.

#### VERMILION PASS

*No. 7 B.*—Monument 7 B is situated on the rounded top of a ridge extending northwesterly from Storm Mt. on the line from Monument 1 B through Monuments 3 B and 5 B.

The ridge runs in a northeasterly and southwesterly direction from Monument 7 B across the direction of the line from Monument 1 B.

The altitude of the point is 8264 feet above sea-level.

The point was marked by a brass bolt cemented in a hole drilled in a large loose limestone boulder. No solid rock was obtainable.

The Divide line runs in a northeasterly direction on the rounded top of the ridge to Monument 9 B and in a westerly direction down steep rock bluffs to Monument 5 B.

The brass bolt was marked "Alberta" and "British Columbia" on respective sides, "7 B" on both ends and "+" on top.

A cairn 6.3 feet high was built over the bolt.

*No. 9 B.*—Monument 9 B is situated on the crest of a ridge running northwesterly from Storm Mt. This summit is the highest point of Storm Mt. visible from Vermilion Pass.

At the monument the ridge turns and runs in a southwesterly direction to Monument 7 B.

The ridge here is composed of big blocks of limestone rock.

The altitude of the monument is 8843 feet above sea-level.

The point was marked by a brass bolt cemented in a hole drilled in a large block of limestone rock.

The slope from the Monument towards the Vermilion Pass falls in steep rocky bluffs to timberline. Twenty feet north of the bolt the rock falls very steeply to the valley of a small watercourse flowing to Altrude Creek.

The bolt was marked "Alberta" and "British Columbia" on respective sides, "9 B" on both ends and "+" on top.

A cairn 5.1 feet high was built over the bolt.

*No. 11 B.*—Monument 11 B is situated on the summit of Storm Mt. at an altitude of 10,332 feet above sea-level.

The apex of the monument is 16.6 feet in a northwesterly direction from Primary Triangulation Signal No. 14 on the highest point of the mountain.

## MONUMENTS "B"—VERMILION PASS



1 B. At edge of auto road



3 B.



7 B. Looking N.



9 B. Looking N.W.



11 B. Looking towards sign 14



2 B. Looking towards 1 B



4 B. Looking towards 2 B



8 B. On Boom mountain



10 B. On Boom mountain

## MONUMENTS "C"—SIMPSON PASS



1 C



3 C



5 C

The surface on the summit of the mountain is composed of finely broken limestone rock. This was dug away and a hole drilled in more solid rock, in which a brass bolt was cemented.

From the summit an easy slope falls to the southwest. A large snow cornice had formed along the north edge of the mountain and below this cornice the rock falls nearly perpendicularly to the valley below. On the east slope very steep rock falls to the valley of the Twin Lakes.

The brass bolt was marked "Alberta" and "British Columbia" on the respective sides, "11 B" on both ends and "+" on the top.

A cairn 5.0 feet high was built over the bolt.

*No. 4 B.*—Monument 4 B is situated on the slopes of Boom Mt. at an altitude of 6935.5 feet above sea-level, overlooking Vermilion Pass.

The point was marked by a brass bolt cemented in a hole drilled in whitish limestone rock on the crest of a rock escarpment extending northeasterly along the eastern slope of the mountain.

This point is considerably below timberline, the slopes being covered with scattered spruce and jack pine. A line is cut through the timber from Monument 1 B; Monument 2 B is on this line. From Monument 4 B a line is cut to 6 B at timberline. Monuments 4 B, 6 B, and 8 B are on the same line.

Above the bolt an even slope rises to Monuments 6 B and 8 B. Below the bolt the fall is a succession of steep drops and rocky ledges for 400 feet, then continues on an even timbered slope to the valley bottom.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "4 B" on both ends and "+" on top.

A cairn 5.6 feet high was erected over the bolt.

*No. 6 B.*—Monument 6 B was placed on the slopes of Boom Mt. on the line between Monument 4 B and Monument 8 B, and is distant 20 chains and 37 links up an even slope from 4 B. It has an altitude of 7568 feet above sea-level.

The point was marked by a brass bolt cemented in a hole drilled in a light grey limestone outcrop.

A few larch trees are seen on the slope in the vicinity of the bolt and extending about 100 feet higher up.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "6 B" on both ends and "+" on the top.

A cairn 6.1 feet high was erected over the bolt. A wooden pole with target was placed in the centre of the cairn for reference from the line of concrete monuments in the valley.

*No. 8 B.*—Monument 8 B is situated on the easterly shoulder of Boom Mt. at an altitude of 8640 feet, on what appears from Vermilion Pass to be the summit.

The brass bolt was placed in a hole drilled in a huge block of grey limestone rock. The top of this rock slopes to the southwest.

## MONUMENTS "C"—SIMPSON PASS



7 C. Looking towards 15 C



9 C Mt. Bourgeau in background



13 C. Looking S.W.



15 C. Looking N.W.



17 C. Looking S.



2 C



4 C. Looking towards 2 C



6 C



10 C. Looking towards 8 C

## MONUMENTS "D"—WHITE MAN PASS



1 D. Looking towards 3 D



3 D



5 D

Three feet north of the bolt the rock falls in cliffs to the valley of the creek flowing from Boom Lake. To the south lies a steep, fairly even slope to the valley of the headwaters of Vermilion River.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "8 B" on both ends and "+" on top.

A cairn 5.4 feet high was built over the bolt.

*No. 10 B.*—Monument 10 B is situated on the highest point of Boom Mt. at an altitude of 9007 feet above sea-level.

Boom Mt. has a long narrow summit with three points of nearly the same altitude and an even slope with very little fall stretching between them.

The monument is on the most westerly of the three points.

The point was marked by a brass bolt placed in a hole drilled in slate coloured limestone rock.

From the summit, the mountain falls in easy slopes to the south for some distance, then much more steeply to the valley of Vermilion River headwaters. To the north precipitous cliffs fall to Boom Lake. East and west the mountain extends in a long ridge, along which lies the Continental watershed.

The brass bolt was marked "Alberta" and "British Columbia" on the respective sides, "10 B" on both ends and "+" on top.

A cairn 5.0 feet high was built over the bolt.

#### SIMPSON PASS

*No. 15 C.*—Monument 15 C was placed on a rocky hill southeast of Simpson Pass summit, at an altitude of 8272 feet above sea-level, and at the end of the ridge extending northerly from Monument 17 C.

A brass bolt was cemented in a hole drilled in a rotten block of very coarse sandstone.

The entire ridge is composed of this conglomerate, of varying degrees of fineness, and is made up of a greatly shattered mass of disintegrated segments, lying one on another in wild confusion. Along the ridge cavernous holes appear between the blocks. Towards the summit of the ridge the material becomes more shaly and fewer scattered blocks are to be seen.

The bolt was marked "Alberta" and "British Columbia" on the respective sides, "15 C" on both ends and "+" on the top.

A cairn 5.5 feet high was built over the bolt.

*No. 17 C.*—Monument 17 C is situated on the summit of the rocky hill southeast of Simpson Pass summit on the north end of which Monument 15 C is placed, at an altitude of 8354 feet above sea-level.

There was no stable rock available, so a hole was drilled in a piece of coarse sandstone and a brass bolt cemented therein. This was set in position on the summit and a cairn erected over it.

The top of the ridge is covered with turf filling between the rocks. The rocks are of coarse sandstone, and are scattered over the rounded crest.

The brass bolt was marked "Alberta" and "British Columbia" on the respective sides, "17 C" on both ends and "+" on the top.

A cairn 5.8 feet high was erected over the bolt.

### WHITE MAN PASS

*No. 5 D.*—Brass Bolt 5 D was placed on an isolated eminence at the north end of the north ridge of Mt. White Man, which dominates the pass at the southern extremity of the straight-line survey, by which the bolt is fixed in position. Altitude of bolt, 8222 ft.

From 3 D the watershed line ascends the steep slope of the ridge to the crest of the eminence referred to; turning to the right, it follows the crest, rising a little higher and then falls swiftly to the saddle between the eminence and the direct north ridge of Mt. White Man, which latter it follows to the summit of the mountain.

The summit of the crest where 5 D was placed is flat; 10 feet to the west of the bolt the slopes fall steeply to the valley of Cross River, and about 50 feet to the east they fall to the headwaters of the south branch of White Man Creek; below the crest is a little lake which drains to the said headwaters. The crest of the eminence is covered by broken rock, grass, moss, etc., and there are outcroppings of solid rock; it is visible from the lowest part of the pass summit.

A hole was drilled in a large, solidly embedded boulder, which may be bedrock, and the bolt cemented therein.

The bolt was marked "No. 5 D" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 6.3 feet high and 5.4 feet at base was built over the bolt.

*No. 6 D.*—Brass Bolt 6 D was placed on the southeast corner of an isolated eminence of the spur extending northerly from the escarpment of the southeastern ridge of Mt. Red Man at 8 D; it is at the northwestern extremity of the straight-line survey, by which it is fixed in position. Altitude of bolt, 8243 ft.

The crest of the eminence lies northwest and southeast. Southward, 4 feet from the bolt, the slopes fall steeply to the amphitheatre of a stream tributary to Cross River. Northeast, there is a fairly steep descent to the valley of a stream tributary to the south branch of White Man Creek. Southeast, the slopes fall gradually to the lowest summit of the pass. Northwest, the crest rises gradually from the bolt to a height of about 50 feet and continues for a distance of about 600 feet to Camera Station No. 2; the slopes then fall gradually to the valley of the north branch of White Man Creek.

A hole was drilled in a solid rock slab and a bolt cemented therein.

The bolt was marked "No. 6 D" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 7 feet high and 4.7 feet at base was built over the bolt.

## MONUMENTS "D"—WHITE MAN PASS



2 D



2 D. Looking towards 4 D



4 D



6 D



8 D



10 D

## MONUMENTS "E"—PALLISER PASS



1 E



1 E. Looking towards 3 E



3 E



5 E



7 E



9 E

*No. 8 D.*—Brass Bolt 8 D was placed on the edge of the escarpment of the southeastern ridge of Mt. Red Man, 4 feet back from the break, at the point where the watershed line turns at right-angles from a southwest to a northwest direction. Altitude of bolt, 8843 ft.

From the bolt the ridge extends northwesterly to 10 D on the summit of Mt. Red Man; the ridge is much broken. Northeast, the ridge falls precipitously to a small glacier below. Southwest, there are rock ledges, with shale slopes between, falling to a high valley tributary to Cross River. Southeast, the ridge and escarpment continue for about a mile to the valley of Cross River. From the angle made by the watershed line an outlying spur traversed by the watershed extends north from the southeastern ridge of Mt. Red Man.

A hole was drilled in reddish limestone rock and a brass bolt cemented therein.

The bolt was marked "No. 8 D" at both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn of blocks of reddish limestone, 6 feet high and 4.5 feet at base, was built over the bolt.

*No. 10 D.*—Brass Bolt 10 D was placed on the summit of Mt. Red Man, situated on the northwestern side of White Man Pass. Altitude of bolt, 9493 ft.

Mt. Red Man is covered at the summit, and for some distance south of it, with very noticeable reddish rock, which supplies the name; the summit is not visible from the lowest part of the pass divide.

From Bolt 8 D the watershed line follows the ridge, which is very broken near 8 D, in a northwesterly direction to near the summit and then up an even slope to the summit of the mountain. Northward from 10 D the northwest ridge drops rapidly in a very rough, broken manner to a high saddle between the valley of the north branch of White Man Creek and the amphitheatre of a stream flowing to Cross River. West of 10 D the slopes fall precipitously to the said amphitheatre. There is a small body of permanent snow and ice near the summit of the mountain on the east side, below the escarpment of the northwest ridge.

A hole was drilled in an outcrop of reddish rock on the summit of Mt. Red Man, which shattered somewhat under the drill, and a bolt was cemented therein.

The bolt was marked "No. 10 D" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 5.8 feet high and 4.5 feet at base was built over the bolt.

#### PALLISER PASS

*No. 9 E.*—Brass Bolt 9 E was placed on the summit of a little rock knoll of the ridge running south from 11 E; it is the eastern terminal point of the straight-line survey of the pass and is fixed in position thereby. Altitude of bolt, 8096 ft.

## MONUMENTS "E"—PALLISER PASS



11 E



2 E



4 E

## MONUMENTS "F"—CROWSNEST PASS



F. From railroad track



1 F and 5 F



3 F



5 F



7 F. Looking towards 9 F



9 F



11 F. Looking towards 9 F



13 F. Looking towards 11 F



15 F

From 9 E the watershed line descends the slope of the ridge in a southwesterly direction and crosses a depression to Monument 7 E, situated on the crest of a parallel ridge. Southerly from the bolt the ridge is rounded on the top and falls very slowly for a few hundred feet; it then falls rapidly to the valley of Palliser River.

The summit of the little knoll is made up of broken fragments of rock; in the vicinity of the bolt it is covered with earth and grassy vegetation. A bed of cement was laid on the rock fragments and a hole made, in which a bolt was set.

The bolt was marked "No. 9 E" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 6.2 feet high and 4.8 feet at base was built over the bolt.

*No. 11 E.*—Brass Bolt 11 E, altitude 8428 ft., was placed on the highest point of the crest of an isolated eminence of the western ridge of Mt. Sir Douglas, which dominates the pass summit on the east side.

From 9 E the watershed line follows the ridge north to the point where 11 E was placed and continues in the same direction for 150 feet farther to where the ridge turns sharply to the right and drops quickly 400 feet to a saddle; it then climbs the steep rock slopes of the western ridge of Mt. Sir Douglas. The crest of the eminence lies in a northeast and southwest direction and is seen in profile from the pass summit; it is partly covered with earth and mountain vegetation.

A hole was drilled in solid limestone rock and a bolt cemented therein.

The bolt was marked "No. 11 E" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 6.3 feet high and 5 feet at base was built over the bolt.

*No. 4 E.*—Brass Bolt 4 E was placed on the watershed at the summit of Mt. Queen Elizabeth; it is the western terminal point of the straight-line survey of the pass and is fixed in position by it. Altitude of bolt, 9349 ft.

To the south, the summit ridge extends for 50 feet on nearly the same level and then falls steeply. To the north, the ridge extends about 10 feet and then falls steeply. Southeast, the watershed lies along a fairly steep and sharp arête. To the west, the watershed follows a sharp ridge for 20 feet and then falls in precipitous crags about 300 feet before rising up the steep face of Mt. King Albert, close by.

The top of the peak consists of great blocks of limestone rock and some shale directly at the summit.

A hole was drilled in a somewhat shattered piece of limestone rock, the best that could be had where a cairn could be built and at the same time be visible from 2 E, and a bolt cemented therein.

The bolt was marked "No. 4 E" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 6 feet high and 5.5 feet at base was built over the bolt.

## MONUMENTS "F"—CROWSNEST PASS



17 F



19 F



21F. With 19F in background



23 F. Looking towards 25 F



25 F



27 F



29 F



31 F. Looking towards 29 F



33F. From 100' towards 35F



35F. From 100' towards 37F



37F. From 100' towards 39F



39 F

## TENT PASS

*No. 81 F.*—Monument 81 F is on the crest of a ridge descending northerly from Tent Mountain summit. Altitude of bolt, 6862 ft.

Ridge sharp; composed of large blocks of limestone with outcrops of solid rock; sparsely covered by dry standing trees mixed with a few green trees in vicinity of the monument.

Hole drilled in outcrop of solid rock; rock shattered under drill; hole sent down to solid bottom and brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 81 F" on both ends and "+" on top.

Cairn 5.5 high; sharp pointed wooden picket in centre of cairn.

Position established by R. W. Cautley's traverse.

*No. 83 F.*—Monument 83 F is on the north sharp corner of Tent Mountain. Altitude of bolt, 7174 ft.

Five feet east a sharp rock drop of 50 ft. to slopes of valley of stream flowing northerly on Alberta side; north of bolt perpendicular rock drop 20 feet to ridge on which bolt 81 F is placed; westerly, a long slope falls to valley of Michel Creek; southeast, gentle descent to crest of Tent Mt.; slopes sparsely covered by small, dry and green trees.

Summit where bolt was placed composed of finely broken rock and soil; no solid rock available for bolt; hole dug and boulders placed therein and cemented together; hole drilled in large boulder and bolt cemented in same.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 83 F" on both ends and "+" on top.

Cairn 5.5 ft. high; pole with cross targets in centre.

Position established by R. W. Cautley's traverse.

*No. 85 F.*—Monument 85 F is on the summit of first knoll of crest of Tent Mt. south from bolt 83 F. Altitude of bolt, 7209 ft.

Knoll covered by small, dry, standing trees and windfall interspersed with scrubby, green second-growth; on east, slopes fall to east branch of Crowsnest Creek, flowing from Ptolemy Pass.

Hole drilled in outcrop of solid, light-grey limestone; brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 85 F" on both ends and "+" on top.

Cairn 5.8 ft. high.

Position established by R. W. Cautley's traverse.

*No. 87 F.*—Monument 87 F is on the most southerly knoll of Tent Mt. Altitude 7186 ft. Tent Mt. has a long crest with several knolls of nearly the same height.

Southeasterly, 100 ft. from bolt, slope falls fairly steeply to a sharp ridge; watershed follows same, turning sharply to left to ridge in which bolt 89 F is placed; northwest, slopes fall to valley of Michel Creek; northeast, slopes

## MONUMENTS "F"—CROWSNEST PASS



41 F. 39 F in background



43 F. Looking towards 41 F



45 F



47 F. Looking towards 45 F



49 F. From 100' towards 51 F



51 F



53 F



55 F



57 F



59 F



61 F



63 F. From 250' towards 65 F

fall to coulée at head of small creek flowing to east branch of Crowsnest Creek; a few dry standing trees near bolt and on slopes.

Hole drilled in an outcrop of solid, grey limestone rock and bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 87 F" on both ends and "+" on top.

Cairn 5.5 ft. high; sharp-pointed wooden picket in centre of cairn.

Position established by R. W. Cautley's traverse.

No. 89 F.—Monument 89 F is on the crest of a small ridge separated from the main crest of Tent Mt. by a narrow ridge at a lower elevation than that on which bolt is placed. Altitude of bolt, 7049 ft.

Watershed line here turns sharply at right angles to previous course and descends the east slopes of Tent Mt. to concrete monument No. 91 F; southwest, slopes broken by deep gullies fall to Michel Creek; slopes covered by dry and green timber; on east side is standing timber, killed by fire.

Hole drilled in an outcrop of solid, grey limestone rock and brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 89 F" on both ends and "+" on top.

Cairn 5.3 ft. high; sharp-pointed picket in centre of cairn.

Position established by R. W. Cautley's traverse.

### PTOLEMY PASS

No. 101 F.—Monument No. 101 F is at the northwest end of a long curving ridge extending westerly from summit of Mt. Ptolemy. Altitude, 6574 ft.

Ridge extends southwesterly from the summit of the mountain, curves to the west and finally to northwest, forming the southern limit of a deep, precipice-walled amphitheatre. Two little lakelets in this amphitheatre are directly north of the end of the ridge where the bolt is placed; watershed line is sharply defined and follows the ridge in a fairly even ascent to the high point on which bolt 103 F is placed; dry standing trees, mingled with a few small, green jack-pine and windfall, on ridge in vicinity of bolt and extend upward along its crest and on western slope.

Hole drilled in an outcropping strata of solid, light-grey limestone rock; brass bolt cemented therein; strata have a sharp break of about three feet on west side of outcrop, necessitating the building of a buttress for the cairn.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 101 F" on both ends and "+" on top.

Cairn 5.8 ft. high; measures 9 ft. from lowest side; 5 ft. wide at base; sharp-pointed wooden picket in centre of cairn.

Position established by R. W. Cautley's traverse of which it is at the eastern end.

# MONUMENTS "F"—CROWSNEST PASS



68 F



67 F



69 F. Looking towards 67 F



71 F. Looking towards 69 F



73 F



75 F. From 100 towards 77 F



77 F



79 F



81 F. Looking N.W.



83 F. Looking N.W.



85 F. Looking N.W.



87 F. Looking N.W.

No. 103 F.—Monument 103 F is placed on the summit of a high point of curving ridge, referred to under 101 F, where curve of ridge turns east. Altitude of bolt, 7629 ft.

On north side, three feet from bolt, ridge falls in steep rocky ledges to floor of shale-filled amphitheatre; on south and west, sides are fairly regular, steep slopes of broken rock; green timber, mixed with scattered dead trees, on these slopes at intervals.

Hole drilled in a large, oblong, grey limestone boulder, firmly imbedded in top of hill; top of hill composed of large, disintegrated masses of grey limestone, covered by dark and yellowish lichens; part of boulder visible approximately 5 ft. long, 3 ft. wide and 2 ft. thick; brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 103 F" on both ends and "+" on top.

Cairn 5.6 ft. high and 5 ft. wide at base.

No. 105 F.—Monument 105 F is placed on the summit of a high, sharp point of curved ridge, referred to under 101 F, where curve of ridge turns northeast. Altitude of bolt, 8657 ft.

To north and northeast, cliffs fall perpendicularly to the western division of the Mt. Ptolemy amphitheatre below the curving ridge following by the watershed line; south and southwest, slope falls very steeply in great rock slabs, partially covered by broken rock and shale; bolt is  $2\frac{1}{2}$  feet from edge of steep, broken rock slope leading to the precipitous cliffs referred to; twenty-four paces easterly from bolt, crest of peak breaks and descends in rocky steps to a precipitous drop of 40 ft.

Hole drilled in bedrock of the summit and brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 105 F" on both ends and "+" on top.

Cairn 5 ft. high and 4.5 wide at base.

No. 107 F.—Monument 107 F is at the summit of Mt. Ptolemy. Altitude 9234 ft.

Summit of mountain is a narrow ridge about 100 ft. long with centre slightly higher than either end; ridge lies nearly north and south; from centre point a ridge runs easterly and divides the headwaters of Ptolemy Creek from those of Andygood Creek; ridge falls steeply from summit; from 105 F, watershed line follows the curving ridge, referred to under 101 F, northeasterly to summit of Mt. Ptolemy and then the easterly ridge mentioned above, thus making a sharp angle; bolt was placed at this angle.

Summit of mountain of finely broken shale and very rotten rock; a rock was brought to the summit and embedded in the shale and, as far as possible, was cemented in its bed; hole drilled in this rock and brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 107" on each end and "+" on top.

Cairn 5.7 ft. high and 4 ft. wide at base.

## MONUMENTS "F"—CROWSNEST PASS



89 F. Looking N.



91 F.



93 F. Bottom of Ptolemy Pass



95 F.



97 F. Looking towards 95 F



99 F. Looking towards 100 F



100 F.



101 F. Looking N.E.



103 F. Looking S.E.



105 F. Looking N.W.



107 F. Looking southerly



2 F. 4 F in background

## NORTH KOOTENAY PASS

*No. 11 G.*—Monument 11 G is on the highest point of the peak rising directly southeast of southern summit of North Kootenay Pass. Altitude, 7775 ft.

A little to the south is another point of the peak of nearly the same height, separated by a shallow gap; peak then descends to a saddle; watershed line crosses same and ascends along the ridge to high point on which monument 13 G is placed.

On east side of bolt, nearly perpendicular cliffs fall to shale slopes of valley from southern summit of pass, leading to Alberta; on west side, steep rocky slopes fall sharply to amphitheatre of which this peak is the northeast portal.

Summit of peak is of huge boulders covered by black, white and green lichens; moss and short tufts of grass are scattered among them.

Hole drilled in solid, reddish, hard rock on highest point of peak and brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 11 G" on both ends and "+" on top.

Position established by R. W. Cautley's traverse of which it is at the southern end.

Cairn, 5.5 feet high with base of 5 feet.

*No. 13 G.*—Monument 13 G is placed on the crest of a high ridge extending southeasterly from bolt 11 G. Altitude 7906 feet.

At point where bolt is placed, watershed line turns at right angles and descends nearly due east to a broad saddle on which the divide is well marked; the slopes and saddle are smooth and clad with scant herbage.

Crest of ridge consists of fine shale and thin slabs of rotten rock; no solid rock available; hole drilled in loose boulder embedded in shale and brass bolt cemented therein.

Bolt marked "Alberta" and "British Columbia" on respective sides "No. 13 G" on both ends and "+" on top.

Cairn 5.6 feet high with base of 5 feet; it is composed of blocks and slabs of shale, no good rock being available; a flat slab of rock stands at top of cairn, 10 inches above it.

*No. 2 G.*—Monument 2 G is on the crest of the ridge followed by watershed line on west side of North Kootenay Pass. Altitude, 7298 ft.

Situated at northern end of R. W. Cautley's traverse; distant from monument 1 G, 10.03 chains on a bearing  $284^{\circ} 13' 59''$ .

Hole drilled in solid rock forming crest of ridge, which is here very sharp, and brass bolt cemented therein; on southeast side ridge drops precipitously to shale slopes falling to northern summit of the pass; on southwest side steep rock ledges, partly covered by shale, descend to stream flowing to Flathead River; crest of ridge is ragged and broken; bolt placed so that flag-pole set in

## MONUMENTS "F"—CROWSNEST PASS



4 F



6 F



8 F. Sentry Mt. in background



10 F. Looking towards 8 F



12 F. From 100' towards 14 F



14 F

## MONUMENTS "G"—NORTH KOOTENAY PASS



1 G



3 G



5 G



7 G. From 100 towards 5 G



9 G



11 G. Looking S.E.

centre of cairn could be visible from monument 1 G; directly beside monument on northern side is a huge boulder, resting on edge of ridge, and with a slope to southwest.

Bolt marked "Alberta" and "British Columbia" on respective sides "No. 2 G" on both ends and "+" on top.

Cairn 6.5 ft. high with base 5 ft. wide; sharp-pointed wooden picket in centre of cairn.

*No. 4 G.*—Monument 4 G is on the crest of ridge extending northwesterly from 2 G; bolt placed at summit of first peak on this ridge from North Kootenay Pass. Altitude 8181 ft.

Crest of peak is a few feet wide and 175 to 200 feet long; bolt set at the highest point; to east of bolt very steep slopes descend in rock ledges, covered and partly covered by shale with scraps of herbage here and there; westerly from bolt a lower broken ridge connects with Squaw Creek E. Station, northerly the watershed line follows a knife-edge ridge to the next high peak, considerably higher than that on which bolt 4 G is placed; southerly from bolt the ridge remains at nearly the same level for about four chains, then turns a little to east and descends in jagged points to northern summit of pass; watershed line follows this ridge.

Hole drilled in light-grey, shattered limestone, and a brass bolt cemented therein as solidly as possible.

Bolt marked "Alberta" and "British Columbia" on respective sides, "No. 4 G" on both ends and "+" on top.

Cairn 5.8 feet high and 5 ft. wide at base; stone set on end in middle of cairn at top.

#### AKAMINA PASS

*No. 7 H.*—Brass Bolt 7 H is on the watershed ridge running southerly from Akamina Pass. Altitude of bolt, 7884 ft.

The watershed runs southerly from 5 H along the summit of a narrow ridge rising gently to the foot of a steep, rock bluff about 200 feet high; then from the top of the bluff over a rounded slope to the summit of the ridge. Bolt 7 H is placed on this rounded slope about 100 feet south from the edge of the bluff and directly on the divide. Easterly from the bolt, at a distance of 60 feet, precipices fall for 400 or 500 feet; the slope then continues very steeply in rock-falls to the shore of Cameron Lake. To the northwest rounded slopes lead to steep rock bluffs falling to Forum Lake. Summit of hill is covered with alpine vegetation, moss, etc.

A hole was drilled in a boulder embedded in the hill; boulder cracked when drilling; crack filled with cement and bolt set therein.

The bolt was marked "No. 7 H" on both ends, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.7 feet high and 4.7 feet wide at base was built over the bolt.

# MONUMENTS "G"—NORTH KOOTENAY PASS



13 G. Looking N.



2 G. Looking S.E.



4 G. Looking southerly

# MONUMENTS "H"—AKAMINA PASS



1 H



3 H



5 H



7 H. From 5 H



7 H. Looking N.E.



9 H. Looking S.



2 H



4 H



6 H.

*No. 9 H.*—Brass Bolt 9 H is on the second highest point of the watershed ridge running southerly from Akamina Pass. Altitude of bolt, 7922 ft.

From the bolt, five lakes can be seen, including Cameron, Waterton and Kintla.

Twenty-five feet to east of the bolt steep slopes fall for 800 to 1000 feet and then continue in rock-slides to the shore of Cameron Lake. To the west and southwest rounded slopes fall to the head of Kintla Valley. To the south the watershed ridge curves to the east and falls to the col on which International Boundary Monument, No. 272, is situated.

A hole was drilled in an outcropping of reddish sandstone and a bolt cemented therein.

The bolt was marked "No. 9 H" on both ends, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.8 feet high and 5 feet at base was built over the bolt.

*No. 10 H.*—Brass Bolt 10 H is on the slope of the ridge to north of Akamina Pass. Altitude of bolt, 7631 ft.

The watershed leads up a very steep, timbered slope from Monument 8 H to about 15 feet from 10 H and then more gently over rounded slopes to 12 H. In the vicinity of the bolt are small stunted pine bushes and scattered, small, dead pine trees.

North and east from the bolt slopes rise gently to the summit of the ridge. Westerly the slopes descend easily above the edge of a sharp descent to the valley floor.

A hole was drilled in red sandstone rock projecting above ground and bolt cemented therein.

The bolt was marked "No. 10 H" on both ends, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.6 feet high and 5 feet at base was built of red sandstone blocks. R. W. Cautley's picket in centre, with small target on top.

*No. 12 H.*—Brass Bolt 12 H is on summit of the ridge to north of Akamina Pass. Altitude of bolt, 7968 ft.

Watershed runs northerly up gentle, rounded slope from 10 H to 12 H and then northwesterly along the summit of a ridge covered with sandstone blocks and gravel. Hill is covered with short herbage and moss between the sandstone blocks. Twenty feet to north of the bolt is a precipitous fall of 800 to 1000 feet to valley of the creek joining Cameron Brook from the west. Precipice continues west and circles to north.

A hole was drilled in a slab of red sandstone rock and the bolt cemented therein.

The bolt was marked "12 H" on both ends, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn of red sandstone blocks, 6 feet high and 5 feet at base, was built over the bolt.

## MONUMENTS "H"—AKAMINA PASS



8 H



10 H Looking S.E.



12 H. Looking S.W.

## MONUMENTS "J"—ASSINIBOINE PASS



3 J



5 J



7 J



9 J



11 J



2 J



4 J



6 J



8 J

## ASSINIBOINE PASS

*No. 9 J.*—Brass Bolt 9 J was placed on the northwest ridge of Mt. Cautley, on the shoulder standing out prominently midway between 7 J and 11 J; it is at the south end of the straight-line survey of the watershed across the pass and is fixed in position by the same. Altitude of bolt, 8587 ft.

East of the bolt, 5 feet, is a precipitous fall to the valley of Bryant Creek. North, 35 feet, is a precipitous fall to the same valley. The fall on the west, or British Columbia side, is fairly steep and regular, shale slopes with grassy patches. Immediately south of the bolt is a grassy patch on the shoulder. A short distance south, a couloir heads from the ridge and sends a stream to British Columbia.

A hole was drilled in bedrock, from which the covering shale had been removed, and a bolt cemented therein; the bolt was not placed at the top of the shoulder, but was so set as to be in good alignment with the watershed.

The bolt was marked "No. 9 J" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 6 feet high and 5.5 feet at base was built over the bolt.

*No. 11 J.*—Brass Bolt 11 J was placed at the watershed on the crest of the middle shoulder of the northwest ridge of Mt. Cautley. Altitude of bolt, 9257 ft.

Northward from the bolt, with but a slight fall, extends the ridge ending in the sheer rock face named Cascade rock. East, 6 feet, is the edge of the steep slopes which fall precipitously to the glacier between Cascade rock and Gibraltar Rock. West, the slopes are more gradual. South, the crest of the shoulder is nearly level for several hundred feet, when, following the edge of the escarpment above the glacier, it curves southeast and ascends gradually to the summit of the mountain. The top of the shoulder is covered with broken shale and scree; shattered slabs of limestone, standing on end, project through the scree.

A hole was drilled in shattered bedrock and a bolt cemented therein.

The bolt was marked "No. 11 J" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 5.6 feet high and 4.5 feet at base was built over the bolt; it is very nearly due west of the cairn, directly across the glacier referred to, built at the camera station on Gibraltar Rock in 1913. The terminal precipices of the northeast ridge of Mt. Cautley are known as Gibraltar Rock.

*No. 6 J.*—Brass Bolt 6 J was placed on Cave Mt., on the straight-line survey of the watershed across the pass, and is fixed in position by the same. Altitude of bolt, 8562 ft.

About 80 feet to the southwest of the bolt, the rolling and gently-falling shale slopes become steep and grass-covered in places, and fall to the summit of the pass and to the valleys on either side.

A hole was drilled in a limestone outcrop of bedrock and a bolt cemented therein.

## MONUMENTS "K"—TORNADO PASS



1 K. Looking N.



3 K



5 K. Looking N.E.



7 K. Looking S.W.



2 K. Looking towards 1 K



4 K. Looking W.

## MONUMENTS "L"—NORTH FORK PASS



1 L



3 L. Tornado Mt. in background



7 L. Looking N.W.



2 L



4 L. Looking N.E.



6 L.

The bolt was marked "No. 6 J" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn of limestone blocks, 6.8 feet high and 5 feet at base, was built over the bolt.

*No. 8 J.*—Brass Bolt 8 J was placed at the north end of the straight-line survey of the watershed across the pass and is fixed in position by the same. It is on the flat-topped, shale crest of Cave Mt., which is covered by small broken rock with an outcrop of bedrock here and there. Altitude of bolt, 8697 ft.

Eastward, 50 feet, the crest falls very precipitously to the valley of Og Pass. Northward, the eastern escarpment of the mountain has an irregular direction towards Mt. Ball, bulging outward in the centre. Southward, the top of the crest is undulating and rises gently, finally falling steeply to the west and southeast. Scattered herbage grows sparsely amongst the shale.

A hole was drilled in an outcrop of bedrock, having a direction nearly due north and south, and a bolt cemented therein.

The bolt was marked "No. 8 J" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on the top.

A cairn 7 feet high and 6 feet at base was built over the bolt; it had a heavy wooden picket in the centre, extending 18 inches above the top and ending in a sharp point.

#### TORNADO PASS

*No. 5 K.*—Brass Bolt 5 K is on the watershed ridge to west of the summit of Tornado Pass and is on the line from 1 K to 3 K produced to a narrow shoulder extending northeasterly from the summit of the peak where 7 K is placed. Altitude of bolt, 8652 ft.

To the east along the watershed sheer precipices fall to the valley floor. To the west steep ledges, covered with shale, fall to an amphitheatre on the north face of the peak. Up and down, the ridge travels in broken ledges separated by precipitous breaks.

A hole was drilled in shattered limestone rock which broke under the drill. A hole was made to the best possible advantage and the bolt cemented in the same.

The bolt was marked "No. 5 K" on both ends, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.5 feet high and 4.5 feet at base was built over the bolt.

*No. 7 K.*—Brass Bolt 7 K is on the highest point of the peak immediately west of the summit of Tornado Pass, altitude of bolt, 9020 ft.

The watershed follows the ridge from 5 K to 7 K where it meets a ridge from the south in a sharp angle and along which it continues. North and east from the bolt are precipices between ledges and rock falls. The ridge running south presents a precipitous wall falling to the valley of the pass. The summit of the peak is of broken rock.

A hole was drilled in a boulder which cracked somewhat under the drill. The cracks were filled with cement and the bolt cemented in the hole.

The bolt was marked "No. 7 K" on each end, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.5 feet high and 5.0 feet at base was built over the bolt.

*No. 4 K.*—Brass Bolt 4 K is on the western extremity of a ridge from the summit of Tornado Mt. on the east side of Tornado Pass. Altitude of bolt, 9766 ft.

The watershed leads from 2 K up a precipitous rock buttress between two chimneys to 4 K and then easterly along the ridge to near the summit of mountain; before reaching the summit it turns northerly along another ridge. On both sides of the ridge precipices fall from ledge to ledge. On the north side, some 100 to 200 feet below, is a steeply sloping bed of snow which descends to a deep, wide couloir running northerly. On the northwest side, looking from the cairn, one can see the summit of the pass and the approaches to it. The spur on which the bolt is set is 400 feet below the summit of the mountain.

A hole was drilled in solid, grey limestone rock and the bolt cemented therein.

The bolt was marked "No. 4 K" on both ends, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.9 feet high and 5 feet at base was built over the bolt.

#### NORTH FORK PASS

*No. 5 L.*—Brass Bolt 5 L is on the watershed ridge to the south of North Fork Pass. Altitude of bolt, 7695 ft.

From the summit of the pass the watershed follows the ridge, rising in three main steps, to 7 L. 5 L is placed on the northerly end of the middle step. The crest of this part of the ridge is covered with alpine vegetation. To the east steep slopes fall to the valley below and to the west more even slopes to the valley of the creek flowing westward.

A hole was drilled in an outcropping rock on the grassy summit and the bolt cemented therein.

The bolt was marked "No. 5 L" on each end, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn was built over the bolt.

*No. 7 L.*—Brass Bolt 7 L is on the summit of the high hill to the south of North Fork Pass. Altitude of bolt, 8415 ft.

The summit is rounded along the watershed but has steep slopes to east and west. The watershed follows the ridge northerly for about 200 feet and then falls in a series of steps with broken rock slopes between to a grassy ridge on which Bolt 5 L is situate. Four feet east of the bolt is a sharp drop of 30 feet to a shale slope descending to a rock wall above a little lake in the valley to the east. To west an even shale slope falls to the valley of a small creek.

Southerly the watershed follows the edge of the ridge, with a steep drop on the east and even shale slopes on the west, across a dip to another summit of about the same elevation, and then on to the summit of Mt. Erris.

A hole was drilled in solid sandstone rock and the bolt cemented therein.

The bolt was marked "No. 7 L" on each end, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.3 feet high and 4.8 at base was built over the bolt.

*No. 4 L.*—Brass Bolt 4 L is on the watershed ridge to the north of North Fork Pass, on what from below appears as a small rock bluff. Altitude of bolt, 7896 ft.

The watershed ridge is well defined above the bolt all the way to Bolt 6 L. Below the bolt steep, rounded slopes fall to the floor of the pass. East and west of the bolt are dry creek gullies, that to the east falling to the valley of Dutch Creek and that to the west to the valley of a branch of Line Creek. About 10 feet southerly from the bolt the rock bluff falls sharply to the rounded slopes above mentioned.

A hole was drilled in a boulder embedded in the rock and the bolt cemented therein.

The bolt was marked "No. 4 L" on each end, "British Columbia" and "Alberta" on respective sides, and "+" on top.

A cairn was built over the bolt.

*No. 6 L.*—Brass Bolt 6 L was placed on the summit of the peak on the north side of North Fork Pass. Altitude of bolt, 8643 ft.

The watershed runs northerly from this peak along a sharp ridge with very steep side-slopes, particularly on the east. Southerly the watershed follows a rounded ridge which becomes more sharply defined as it descends until 4 L is reached. A third ridge sharp from the summit runs in a south-easterly direction falling in steep pitches between easy slopes to the Alberta side of the pass. A fourth ridge runs in a southwesterly direction from the summit, holding its elevation for some distance and then falling off to the valley of the creek on the British Columbia side of the pass.

A hole was drilled in a solid outcrop of light-grey limestone rock and the bolt cemented therein; the summit is composed of large broken blocks of rock.

The bolt was marked "No. 6 L" on each end, "British Columbia" and "Alberta" on respective sides and "+" on top.

A cairn 5.5 feet high and 5 feet at base was built over the bolt.

### ELK PASS

*No. 23 M.*—Brass Bolt 23 M is on the watershed near the centre of a little rocky hill standing out prominently, not far above timberline, from the steep slopes forming the eastern wall of the pass. Altitude, 8152 ft.

The watershed descends a well-defined ridge from Bolt 25 M, which is on the summit of a peak of the Elk Mountains. The ridge ends in a bluff and turns

## MONUMENTS "M"—ELK PASS



1 M



3 M



5 M



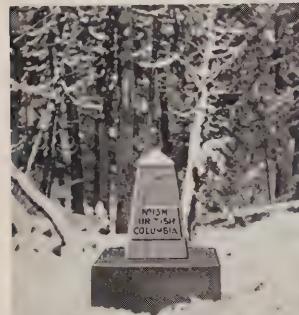
7 M



9 M



11 M



13 M



15 M



17 M



19 M



21 M



23 M. Looking S.W.

sharply to the left, thereby making the little rocky hill referred to across the general slope. Below 23 M, the watershed descends even slopes of broken rock and shale, sparsely covered with scrubby spruce bushes and trees, to Monument 21 M. The cairn over the bolt is very conspicuous from the lower slopes of the pass.

A hole was drilled in a somewhat shattered outcrop of limestone rock; the cracks were filled with cement and the bolt cemented therein.

The bolt was marked "No. 23 M" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on top.

A cairn 6.3 feet high and 6 feet at base was built over the bolt.

*No. 25 M.*—Brass Bolt 25 M is on the highest point of a peak of the Elk Mountains, over which the watershed passes. The top of the peak is of broken and shattered limestone. Altitude, 9025 ft.

From 25 M the slope descends steeply, towards the west, for some distance in a broken rock-slide; the watershed then follows a steeply descending ridge in abrupt steps to 23 M; the ridge is precipitous for a short distance on the south side and descends very steeply the rest of the way to the catchment basin of a strong-flowing stream forming the headwaters of Tobermory Creek; on the north side the ridge falls very steeply with broken, rock ledges to a dry watercourse which, in the timber, flows north.

East of the bolt there is a precipitous escarpment falling to the valley of Pocaterra Creek; northwesterly a ragged ridge, the summit of the range, extends in a curve to the peak on which Highwood Pass W. Station is set; southeasterly a similar ragged ridge, which is followed by the watershed, leads to Mt. Tyrwhitt; both stations are on peaks considerably higher than that on which the bolt was placed. At the bolt, the watershed turns southeasterly, making a sharp angle with its previous course.

A hole was drilled in a projecting fragment of shattered limestone and the bolt cemented therein.

The bolt was marked "No. 25 M" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on top.

A cairn of grey limestone rock 6 feet high and 4.5 feet at base—all the space available—was built over the bolt.

*No. 6 M.*—Brass Bolt 6 M is on the watershed at the crest of a rocky hill immediately west of Monument 4 M. Altitude, 7524 ft.

The line of watershed describes an elongated bow northward from 4 M to 6 M.

The point where the bolt was set is on the west end of an isolated ridge of which the crest is 100 to 150 feet long. The ridge is grown with scrubby spruce bushes and is well below timberline. The bolt is on nearly the highest point of the ridge. Westward, the ridge descends about 200 feet to a grassy saddle,

where the watershed is sharply defined; the watershed then ascends a grassy slope, where it is also well defined, to a higher point above timberline. From this point it follows the eastern arête of the mountain to Bolt 8 M at the summit. Southward from the bolt, the slopes fall perpendicularly in rocky steps to the outlet from Frozen Lake, and are grown with scrubby spruce in patches; northward, steep slopes of broken rock and shale, mingled with rock exposures and grassy patches, fall to grassy alplands, where scattered scrubby spruce and small larch are seen. Eastward, are steep slopes of rock and grass-land, well grown with scrubby spruce and larch. From the bolt, Monuments 4 M, 2 M and 1 M can be seen.

A hole was drilled in solid rock and the bolt cemented therein.

The bolt was marked "No. 6 M" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on top.

A cairn 5 feet high on the west side and 7 feet high on the east side, with a base of 5.5 feet, was built over the bolt. The rock is of grey and dark-blue limestone with some fragments of brown cherty limestone.

### MONUMENTS "M"—ELK PASS



25 M. Looking S.E.



2 M



From 2 M to 4 M



4 M



6 M. Looking East



8 M. Looking N.W.

*No. 8 M.*—Brass Bolt 8 M is on the summit of the first high peak on the west side of Elk Pass, over which the watershed passes. Altitude, 9752 ft.

The position of the bolt, looking from the pass, does not appear to be on the summit, as a ridge extends from the bolt towards the pass for 400 or 500 feet at a slightly lower elevation, then dropping rapidly to Bolt 6 M; the watershed follows this ridge. At 8 M the watershed makes a sharp turn to the northwest and follows a well-defined ridge over a saddle to a considerably higher peak.

A hole was drilled in solid rock on the summit and the bolt cemented therein.

The bolt was marked "No. 8 M" on both ends, "Alberta" and "British Columbia" on respective sides and "+" on top.

A cairn 6.3 feet high and 5 feet at base was built over the bolt.

## APPENDIX II

TABLE OF LATITUDES AND DEPARTURES REFERRING BRASS BOLTS  
AND CAIRNS TO NEAREST BOUNDARY MONUMENTS

No. of Bolt and Cairn	Latitude		Departure		No. of Reference Monument
	North chains	South chains	East chains	West chains	
KICKING HORSE PASS					
11 A		20.51		19.96	9 A
13 A		26.87		27.82	9 A
15 A		174.86		30.51	9 A
8 A	3.42			43.05	6 A
10 A	9.89			56.36	6 A
12 A	12.06			132.91	6 A
VERMILION PASS					
7 B		12.60	24.75		5 B
9 B	5.94		55.36		5 B
11 B		83.18	102.38		5 B
4 B	41.68			22.84	2 B
6 B	61.12			30.11	2 B
8 B	84.18			38.74	2 B
10 B	101.00			88.20	2 B
SIMPSON PASS					
15 C		36.44	17.77		13 C
17 C		50.55	17.30		13 C
WHITE MAN PASS					
5 D		21.61	21.07		3 D
6 D	7.04			20.76	4 D
8 D		23.83		52.67	4 D
10 D	17.32			107.99	4 D
PALLISER PASS					
9 E	18.59		25.30		7 E
11 E	33.81		23.03		7 E
4 E	34.02			46.05	2 E
TENT PASS					
81 F		21.27	16.31		79 F
83 F		38.81	16.04		79 F
85 F	9.28			52.66	91 F
87 F		6.18		38.92	91 F
89 F		32.95		16.40	91 F

TABLE OF LATITUDES AND DEPARTURES REFERRING BRASS BOLTS  
AND CAIRNS TO NEAREST BOUNDARY MONUMENTS—*continued*

No. of Bolt and Cairn	Latitude		Departure		No. of Reference Monument
	North chains	South chains	East chains	West chains	
PTOLEMY PASS					
101 F		4.50	18.70		100 F
103 F		48.17	59.49		100 F
105 F		53.98	104.78		100 F
107 F		21.28	135.28		100 F
NORTH KOOTENAY PASS					
11 G		27.07	16.76		9 G
13 G		51.31	31.13		9 G
2 G	2.47			9.72	1 G
4 G	29.84			11.72	1 G
AKAMINA PASS					
7 H		36.86		22.80	5 H
9 H		48.13		20.19	5 H
10 H	41.05			6.43	8 H
12 H	57.56			3.09	8 H
ASSINIBOINE PASS					
9 J	0.11		32.14		7 J
11 J		14.98	53.70		7 J
6 J	18.99		22.45		4 J
8 J	37.54		28.31		4 J
TORNADO PASS					
5 K		1.26		11.63	3 K
7 K		6.29		16.23	3 K
4 K	9.22		25.61		2 K
NORTH FORK PASS					
5 L		36.29		6.79	3 L
7 L		66.29		9.99	3 L
4 L	19.56		2.24		2 L
6 L	42.12		2.27		2 L
ELK PASS					
23 M	20.84		20.69		21 M
25 M	29.28		44.10		21 M
6 M		9.74		24.19	4 M
8 M		40.40		84.07	4 M



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